DEVELOPMENT AND IMPLEMENTATION OF A COMPUTERIZED ADVANCED STANDING EXAMINATION IN BASIC CLOTHING CONSTRUCTION

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CHAPTER I

INTRODUCTION

The evaluation of a student's knowledge and competence is a continuing process in the field of education. One important evaluative method that is becoming accepted in colleges and universities is the use of advanced standing examinations. These examinations assess a student's level of proficiency in a specific subject matter area. If the student shows sufficient mastery of the subject matter, the student may accelerate in the program and/or receive college credit for a specified course.

Through the years educators have stressed the importance of evaluating the level of the students to prevent repetition in curriculum. Furst (1958, p. 13) emphasized the idea of placing students according to capabilities:

> Placement can contribute to the better articulation of secondary and higher education by accelerating the students who have already attained some of the major objectives of the college curriculum. Acceleration of the well qualified students is one of the most urgent needs in American higher education.

According to the Oklahoma State Regents for Higher Education (1972) institutions should give students recognition for academic learning that has occurred outside the formal college classroom setting. Experiences could include learning that has taken place in high school, proprietary school, vocational-technical school, the military service, or through educational television and individualized study. Stainback

and Stainback (1973) reiterated this philosophy when they suggested that students who demonstrate the knowledge of materials and can apply it should advance to another level of learning.

At Oklahoma State University, a basic clothing construction course is required for students majoring in clothing, textiles, and merchandising or in home economics education and community services. These students enter college with a wide range of knowledge and experience in clothing construction. Faculty in the Clothing, Textiles, and Merchandising Department recognize the need to accelerate students who are proficient in basic clothing construction. During previous years, evaluative instruments have been used in various ways. Students have taken written and/or practical examinations for placement or exemption purposes, and advanced standing examinations have provided the opportunity for college credit. Clothing, textiles, and merchandising faculty at Oklahoma State University have not consistently used examinations for evaluating students' mastery of subject matter for the basic clothing construction course because of the amount of time involved for instructors to schedule, administer, and score the examinations and the difficulty in keeping the test items current and confidential.

Increasing demands for the offering of course and degree credit by examination have resulted in the need for better and more efficient means of test construction and administration. Lippey (1974) suggested that the utilization of computer-assisted test preparation and execution in educational environments is within reach of virtually every educator.

The clothing construction courses at Oklahoma State University

are continuously undergoing revision and previously developed statements of competencies needed to be revised for the basic clothing construction course. Instructors could then use the competencies as a basis for developing test items for an advanced standing examination for the course.

Development and implementation of a computer-generated advanced standing examination for the basic clothing course was listed in the 1980-85 objectives for the clothing, textiles and merchandising department. With the broad use of computer programming and the availability of computer systems on the university campus, a computer-generated examination would allow for efficiency in administration and revision, accuracy and speed in scoring, and an opportunity for the students to take the examination at their own convenience.

Purpose and Objectives

The purpose of the study was to determine essential competencies for a basic clothing construction course for use in the development and implementation of a computer-generated advanced standing examination. The three specific objectives for the study were:

1. Determine competencies for basic clothing construction considered essential by faculty of clothing departments in selected state universities and land grant colleges.
2. Develop an item pool for a basic clothing construction examination based on the competencies identified by clothing faculty respondents.
3. Design a computer program to generate an advanced standing examination in basic clothing construction.

Assumptions

The following assumptions were pertinent to the design of the study:

1. Students enter college with a wide range of knowledge and competence in the field of clothing construction.
2. Knowledge and competence of a student in the field of clothing construction can be evaluated through use of a computer-generated advanced standing examination.
3. Professionals with expertise in the clothing field are able to identify essential competencies necessary in developing an evaluative instrument to be used as an advanced standing examination for the basic clothing construction course.

Limitations

The sample selected for the survey was limited to clothing faculty in member institutions of the National Association of University and Land Grant Colleges that granted 15 or more bachelor's degrees in clothing, textiles and merchandising between September 1, 1978 and August 31, 1979. The study was limited to competencies and objectives for a basic clothing construction course. The test items developed were limited to those that could be programmed on and generated by the computer.

Definition of Terms

The definitions of the terms used throughout the study are listed as follows:

Basic Clothing Construction - fundamental techniques and skills involved in the production of a garment.

Basic Clothing Construction Course - the most elementary clothing construction course offered at Oklahoma State University. It has no prerequisites and includes fabric selection, basic fitting, and sewing techniques (Oklahoma State University, 1981).

Basic Clothing Construction Examination - an instrument used to evaluate essential competencies required for college credit in the basic clothing construction course.

Advanced Standing Examination - an instrument used to evaluate sufficient mastery of subject matter for the purpose of accelerating the student in an academic program and granting college credit for a specific course.

Competency - an outcome of education that the individual should attain in a given course (Burns, 1972; Klingstedt, 1972; and Young and Mondrans, 1972).

Video Display Terminal - a device equipped with a keyboard and display similar to a small television screen capable of sending and receiving information over a telephone wire or microwave beam (Vocabulary, 1981).

Computer Generated Examination - an examination in which the computer randomly selects questions from an item pool and presents them to the student (Good, 1974).

Item Pool - a bank of test items stored on a computer tape (Good, 1974).

Item Analysis - a technique for appraising responses to each test item to determine item difficulty and discriminating power (Ahman and Glock, 1975; Gronlund, 1976).

Evaluation - a systematic process of determining the extent to which objectives of planned instruction are achieved (Cross, 1973; Gronlund, 1976).

Organization of the Study

The study is organized into four chapters. The significance of the study is stated in the introduction to Chapter I, followed by the purpose of the study, objectives, assumptions, limitations and definition of terms. A review of literature relevant to the research is discussed in Chapter II. A detailed description of the methods, procedures and analysis of data used to establish competencies for the basic clothing construction course, develop an item pool, and implement a computer-generated advanced standing examination in basic clothing construction is included in Chapter III. The summary, conclusions and recommendations are presented in Chapter IV.

CHAPTER II

REVIEW OF LITERATURE

A review of literature related to the purpose and objectives was conducted to reveal the importance of the problem, guide in the formulation of the problem and aid in the interpretation of the problem. The problem identified for the study involved three phases: determining competencies for a basic clothing construction course, developing an item pool, and implementing a computerized examination. Topics reviewed in the chapter included competencies needed in clothing construction, evaluation in education, computer application in education and related clothing and textiles research at Oklahoma State University.

Competencies Needed in Clothing Construction

Clothing construction has long been identified as an essential component of the home economics curriculum in higher education. Through the years, clothing construction courses have expanded and the focus of the courses has changed to meet the needs of the students. Competencies are periodically evaluated to prevent overlap of course content and updated to insure relevant subject matter. Clothing construction competencies for each course build on the competencies from the previous courses. The determination of competencies necessary for a beginning course in clothing construction is an important part of

the process in revising curriculum for clothing construction courses.

Definitions of Competency

To initiate the process of identifying competencies for basic clothing construction the definition of competency was reviewed. Burns (1972), Klingstedt (1972), and Young and Mondrans (1972) defined competency as a behavioral outcome of the educational preparation that the individual should attain and which is considered essential for the performance in a given class. Competency was defined by King (1977, p. 4) as "an attitude, behavior, skill, or understanding demonstrated by a participant at a specified performance level." She stated that a competency is broad in scope.

Holland (1978, p. 7) described competency as "knowledge, skills, attitudes, understanding and judgment which a student demonstrates at a predetermined proficiency level." Another description for competency was an ability to apply the essential principles and techniques of a particular subject matter field (Carpenter, 1968).

Meszaros and Baird (1979, p. 8) identified competency as a "general, student-oriented behavioral statement of a task requiring the mastery of performance objectives with no reference to condition or criteria." They recommended the following format for stating competencies.

Competencies should:

1. be written in terms of the student
2. be general
3. identify the knowledge, behaviors, skills, or attitudes the student will have when completing the instruction

4. use a verb to describe student outcomes

5. not refer to conditions or criteria

According to Kholmann (1975, p. 20) "competency statements are behavioral statements that serve as a guide to the selection of criteria, thus facilitating the assessment of student behavior." She suggested that the competency statements should include a wide range of behavior - cognitive, psychomotor, and affective (especially as associated with the cognitive and psychomotor domains). In contrast to Meszaros and Baird (1979), Kholmann stated that corresponding criteria assessment should accompany each competency statement.

The three basic principles of competency-based programs are identifying competencies, designing instruction and evaluating a program (Lindsey, 1973). He stated that there is usually a tendency to select too many competencies. In designing instruction, activities should be relevant to the identified competencies and evaluation of the program should be completed when competencies are validated. Hughes and Fanslow (1975) stressed the importance of assessment of competencies to help one determine whether a student passes or fails.

Clothing Construction Competencies

General attempts have been made to determine clothing construction competencies. According to research in the field of clothing and textiles, subject matter content and format for competencies varied.

Seventy-one home economists participated in a national workshop sponsored by the American Home Economics Association to develop a list of competencies and criteria for professional education in home economics (Home Economics Teacher Educators, 1978). The competencies

and criteria pertaining to functions of clothing/apparel and textile products were identified for teachers. These competencies were broad in scope and were presented as a basis for home economics teachers entering the profession.

At Oklahoma State University, Miller (1974) investigated competencies for beginning clothing construction at the college level. The sample for the study included 124 educators in the following six categories: (1) Clothing Specialists in Extension, (2) State and District Supervisors in Home Economics Education, (3) Secondary Vocational Homemaking Teachers, (4) Clothing Professors in State Colleges, (5) Clothing Professors in Universities, and (6) Home Economists in Business. Fifty-two competencies were identified for a beginning clothing construction course and 17 competencies were identified for courses other than beginning clothing construction. Competencies were divided into the following categories:

1. Selection, cutting, marking
2. Alteration
3. Operation of sewing machines
4. Seams and seam finishes
5. Construction processes
6. Preparation and hand stitching
7. Fasteners
8. Miscellaneous

Recommendations were made that competencies in clothing construction should be continually investigated, revised and updated with the introduction of new technology in the clothing and textile industry. Miller also recommended a follow-up study to test consistency of

choices in identifying competencies for clothing construction.

At Iowa State University Vermilyea (1967) studied the merit of two college courses in clothing construction. The purpose of her study was to determine whether an elementary course in clothing construction and a course in pattern making prepared students equally well for a subsequent clothing course. Findings indicated that students from the two courses were equally prepared for the advanced course.

Davis (1969) conducted a study at Ohio State University to determine how a self-instructional program for a specified clothing construction technique could be structured to provide maximum efficient learning experiences for students. A comparison of two programs of self-instruction for clothing techniques was made. One program was structured to give students detailed procedural directions. The second program was nonstructured and gave students only an introduction to the technique and learning situation. Results of the study indicated that students expressed preference for some guidance and direction when learning in a self-instructional setting. Students also preferred the medium in which the process most resembled a live demonstration.

At Texas Technological University, Ettle (1969) investigated clothing practices and feeling of competence in clothing construction of clothing and textiles majors and home economics majors. Ettle found that practice and training in the area of clothing construction were major factors influencing the feeling of student competence in clothing construction skills and in teaching and demonstrating these skills to others.

Evaluation in Education

The primary purpose of education is to effect a behavioral change in students. The role of the teacher is to facilitate the change by providing a means for students to improve their knowledge, behaviors and attitudes. In the present educational system, there is often a gap between what students feel they themselves have accomplished and what the teachers feel the students have accomplished (Cross, 1973). In order to evaluate behavioral changes, specific goals or objectives must be defined, understood and accepted by both the teachers and the students.

Though evaluation has various meanings, the most widely accepted definition by teachers is "a process which determines the extent to which objectives have been achieved" (Cross, 1973, p. 5). Evaluation is a systematic, continual process of assessing student growth and is an integral part of teaching and learning. Gronlund (1976) stated that sufficient mastery of objectives might indicate the desirability of a student skipping certain units or being placed in a more advanced course.

Evaluative Instruments

Evaluative instruments are the tools or means of determining the extent to which educational objectives or competencies have been attained (The Indiana Home Economics Association, 1974). The five important concepts that comprise the basis for characteristics considered to be desirable in any evaluative instrument are usability, objectivity, discrimination, reliability and validity. According to

Cross (1973), the most important of all the desirable characteristics is validity. Conventional statistics for determining validity are inappropriate for a good criterion-referenced mastery examination since variability among scores is not a necessary condition (Gronlund, 1976; Popham, 1978). Cross (1973, p. 75) stated that "content validity is the degree to which the evaluating instrument measures the subject matter content and the behavior under consideration." Gay (1976) described concurrent validity as the degree to which the scores on one performance relate to the scores on another current performance. Gronlund (1976) stated that reliability indicates the degree to which an examination consistently measures whatever it is meant to measure and refers to the results obtained with the instrument. An estimate of reliability always refers to a particular type of consistency. Reliability is a necessary condition for validity but unlike validity, reliability is primarily statistical in nature.

Objectivity of an examination refers to the degree to which equally competent scorers obtain the same results. When highly objective procedures are used, the reliability of the examination results is not affected by scoring procedures (Gronlund, 1976).

According to Cross (1973) usability of an examination implies convenience, availability, serviceability and advantage. Administration, scoring, cost and application of data are also involved in the usability of an instrument.

Many colleges and universities offer students an opportunity to obtain college credit by examination. Students who believe they have acquired sufficient mastery of specific subjects through on-the-job experiences, reading, travel, correspondence courses, workshops,

television, or other means of learning experiences can receive credit if examination results are acceptable to the college. According to Jones (1975) students can save both time and dollars when they are allowed to test out of required courses.

For several years Oklahoma State University has granted college credit through advanced standing examinations administered by its own academic departments. As a National Testing Center for the College Level Examination Programs (CLEP), Oklahoma State University also offers examinations in various subjects. College credits earned through advanced standing examinations given by Oklahoma State University are accepted by most major universities throughout the United States.

Test Construction

Ahmann and Glock (1975) described a test as a measuring instrument that includes a group of questions or tasks to which a student is to respond. In order to attain the goal of improved learning and instruction eight basic steps were identified by Gronlund (1976, p. 136):

1. Determining the purpose of testing
2. Building a table of specifications
3. Selecting appropriate item types
4. Preparing relevant test items
5. Assembling the test
6. Administering the test
7. Appraising the test
8. Using the results

The actual construction of test items is a crucial step because the validity of the examination is determined by the extent to which the behaviors to be measured are actually measured by the test items (Bloom, 1974; Gronlund, 1976). Objective examinations are those which

can be scored with an inflexible key. Multiple-choice, matching or true-false items are useful in measuring the knowledge level of learning. Matching and multiple-choice items are readily used for measuring comprehension. One of the major types of items that can measure the application level is multiple-choice items (Blankenship and Moerchen, 1979).

Multiple-Choice Items

Multiple-choice items consist of a stem and a designated number of options or alternatives. The stem is usually a direct question or a statement which is completed by one of the possible alternatives. Incorrect or less desired alternatives are called distracters, or foils. The student is directed to select the correct or best alternative from all the options.

Sax (1980) observed numerous advantages of multiple-choice items. One of the primary advantages is the great versatility in measuring objectives at all levels of the cognitive domain. The teacher can sample a substantial amount of course material in a relatively short period of time. Scoring is objective and the format is amenable to item analysis. Items can be constructed that require students to discriminate among options that vary in correctness. When items have from three to five options, the effects of guessing are reduced. There are relatively few disadvantages of multiple-choice items. Items are difficult and time consuming to construct as distracters are hard to identify. Response time for answering multiple-choice items takes longer than the same number of true-false items (Ahmann and Glock, 1975). The following suggestions were given by Sax (1980):

1. The stem should introduce what is expected of the examinee.
2. Avoid specific determiners.
3. Use vocabulary suited to the maturity of the students.
4. Stems and options should be stated positively whenever possible.
5. Options should be plausible.
6. Items should have a defensible correct or best option.
7. Avoid items measuring opinions.
8. Vary the placement of the correct option.
9. Avoid overlapping alternatives.
10. Use "none of the above" as an option only if there is an absolutely right answer.
11. Avoid using "all of the above" as an option.
12. The stem should be clear and grammatically correct and should contain elements common to each option.

Matching Items

In traditional form, the matching items consist of two parallel columns with items in one column and options in a second column. Matching items are simple to construct and score and are well suited to measuring associations. Matching items also reduce the effects of guessing. One disadvantage is the tendency to ask students to associate trivial information. Teachers who use electronic test scoring services are limited to five options on most commercial answer sheets. Sax (1980) listed the following suggestions for writing items in matching tests:

1. Use homogeneous options and items.

2. Have more options than items.
3. Arrange options and items alphabetically or numerically.
4. Limit the number of items within each set.
5. Place the shorter responses in column B.
6. Provide complete directions.
7. Place options on same page.
8. Avoid specific determiners.

True-False Items

A true-false item consists of a statement to be marked true or false. The true-false item can help ensure an adequate sample of items within a limited time period. Scoring is mechanical with a high degree of objectivity. One of the main weaknesses of a true-false item is the chance of guessing. The probability of guessing correctly is .50 for each item. Constructing unambigious true-false items is very difficult. Another disadvantage of true-false items is the emphasis on rote memorization. The criteria suggested by Sax (1980) for writing true-false items included:

1. Construct items that measure important objectives.
2. Avoid the use of specific determiners.
3. Approximately half the statements should be false.
4. Each statement should be unequivocally true or false.
5. State each item positively if possible.

Computer Application in Education

The impact of the computer on modern society is increasing at a high rate of speed. Formerly an investigation of computer application

to curriculum research and applied instructional programs would have produced very little information. Today the computer is being used at all levels of education; elementary, secondary and university. Over half the students who use computers in higher education are concentrated in the departments of computer science, engineering, and business (Molnar, 1981). According to Albrecht (1973, p. 161) "it would be a disservice to students if they were not given an opportunity to use computers during their education." Molnar (1981) stated that a computer literate population is as important to an information society as energy and raw materials are to an industrial society. Computer application in education was supported by the Carnegie Commission on Higher Education. The commission recommended greater use of the new electronic technology to supplement traditional teaching (Priorities for Action, 1973).

Computer Usage

The versatility of computer usage is challenging to the educator. Shostak (1981) reported that rapid advances in the integration of computer capabilities with information handling technologies such as television, records, hard-copy printers, video recorders, and industrial robots are expected in the 1980's.

Computer usage opens a virtually unlimited area of research on learning as well as the potential of programming individual differences in needs for educational programs. Examples of innovative developments facilitated by the computer were cited by Bushnell (1967, p. 59):

1. Simulating learning environments for gaming purposes and for the improvement of educational administration.

2. Automating information-retrieval sources.

3. Assisting in the preparation and evaluation of instructional materials.

4. Integrating instructional media (film, tape, television display and text) for both group and individual instruction.

5. Applying the power of the computer to massive data collection, controlled observation, and analysis for the study of instructor-learner interactions.

6. Decentralizing the education system by bringing remote-control educational resources into the home, study carrel, community library or faculty office.

Bushnell (1967) concluded that as a society faces the challenging reality of individual differences, an exploding curriculum, and the pressures of time and numbers, the use of modern information processing technology is necessary if the goal of education for all Americans is to be achieved.

Atkinson and Wilson (1969) cited three factors which contributed to the growth of computer-assisted instruction: a surge of interest in programed instruction during the 1950's, the mushrooming of electronic data processing in general, and the increasing aid to education by the federal government such as the National Science Foundation and the Elementary and Secondary Education Act of 1965. These factors continue to be important and relevant today.

When computers are used in education, a terminal is the communication link between the student and the computer. The function of the terminal is to present instructional materials and to record and transmit student responses to the central computer for analysis. According to Watson (1972) simple, intermediate, and complex terminal configurations are used for student terminals. Simple terminal configurations have a teletype connected by phone wires or a touch pad to the central

computer. In addition to teletype, intermediate terminal configurations include various audiovisual devices for optical projection and audio reproduction. Complex terminal configurations include video display terminal, audio and film display, teletype, and light pen and they allow the student to respond by teletype or the light pen.

The video display terminal is frequently used in higher education. One of the advantages of the video display terminal is its ability to quickly generate graphics and print displays under computer control. The response to the stimulus display can be made by the use of a light pen, rather than the typewriter. Another advantage of the video display terminal for educational application is its quiet operation, whereas a typewriter terminal is a noisy operation (Good, 1974).

Major considerations in developing interaction in different instructional modes through computer technology were identified by Allen and Bushnell (1967, p. 226):

1. The specific needs of specialized courses
2. Human acceptance and convenience of operations
3. Articulation with noncomputer components
4. Teacher ease in course presentation and alteration
5. Economic feasibility.

The means of response provided should be natural for the student and appropriate to the instructional goals.

Through a study on the use of the computers in 50 school settings, Roecks (1981) found that a category of computer applications entitled "institutional coordination" was needed in addition to the 12 categories previously cited by Watts (1981). The "baker's dozen" of computer uses in education were listed by Roecks (1981, p. 16):

1. Administrative
   - Accounting, payroll, and employee records
   - Attendance, grades, and student records
   - Timetabling, planning systems

2. Curricular Planning
   - Resource information file
   - Production of instructional materials
3. Professional Development
4. Library
5. Research
6. Guidance and Special Services
   - Vocational and counseling
   - Diagnosis and remediation
7. Testing
   - Test construction
   - Test scoring
   - Test evaluation and analyses
8. Instructional Aid
9. Instructional Management
10. Computer Assisted Learning
11. Computer Awareness and Literacy
12. Computer Science
13. Institutional Coordination
    - Information sharing
    - Coordination of existing computer services

Milner (1980) and Podemski (1981) described diverse instructional uses of the computer in education. Two functions of computer based instruction are computer-assisted instruction and computer managed instruction. In computer-assisted instruction students receive instructional assistance directly from the computer. Computer-assisted instruction applications include branching techniques, drilling capabilities and practice programs (Huntingdon, 1979; Cavin, Cavin and Lagowski, 1979; Joiner, Silverstein and Ross, 1980). Spitzer (1980) discussed simulation and gaming as a part of computer-assisted instruction through which students learn consequences of decision making and problem solving behavior. Through computer-managed

instruction, teachers can plan and monitor student learning experiences. Schneider (1980) developed a procedure for assessing student skill levels in a secondary math curriculum. Computer managed instruction programs allow the teacher to plan curricular and instructional options for instructional objectives on the basis of a student's individual abilities and performance (Podemski, 1981).

Computer Testing

In the past, familiar uses of computer technology in testing were related to scoring of answer sheets and analyzing of data recovered from scoring. The increasing demands for self-paced learning and offering of courses and degree credit by examination have resulted in the need for more efficient means of test construction and administration. Lippey (1974) suggested that both instruction and testing should be based on common instructional objectives or competencies. He stated that the utility of computer-assisted test preparation and execution is within reach of virtually every educator. Lippey described five ways in which the computer can support test preparation. Item banking is a method of storing questions in a machine readable form. Item generation consists of generating questions which are dependent upon input variables. Item attribute banking is the banking of item properties for test construction systems. Item selection provides computer assistance in selecting items according to attributes specified by the test constructor. Test printing includes tests reproduced on carbon masters, reprinted in large quantities, printed with items resequenced at random, and printed with unique copies for each student.

A computer system known as an Automated Examination Generator was first used in 1969 at the University of Wisconsin. The system computed procedures to generate examinations, score academic performance and report student achievement with suggestions designed to remediate specific scholastic weaknesses.

Prosser and Jensen (1971) developed the method of Computer Generated Repeatable Tests. The process consisted of four steps: developing pools of test items, producing examinations, administering the examinations and scoring students' responses. Prosser (1973) stated that the computer took 20 seconds to format and record 1000 three-page examinations and about three hours were needed for printing. The total cost of testing a student in a repeatable testing course ranged from $0.50 to $1.50.

Baker (1973) described an interactive computer program for test construction and analysis. The data base consisted of an item file, a statistics file and a test file. The design of the Test Construction and Analysis Program System focused upon the instructor as the primary user and allowed the instructor to maintain a personal item pool, create examinations upon demand and automate the data base maintenance functions.

Cohen and Cohen (1973) reported the implementation of computer-generated individual examinations for two student-paced undergraduate psychology courses at Florida State University. For each student as many as six examinations could be generated for a particular unit of study and test items were randomly selected from nine separate item pools. On the average students required only two attempts per unit before meeting the criteria to proceed to the next unit.

A system called Computer Paced Instruction was developed by Dudly (1973). A computer acts as a repository of information for progress of students through a set of test items and also acts as a repository of information for the test items themselves. The computer test bank generates an examination over the assigned section of course material. When students obtain a specified minimum score previously designated by the instructor, they continue with another section of course material. Though the computer can produce various outputs for the instructor, the most popular request is for a list of the items missed showing the student's answer and the correct answer along with a reference to the course material. This information enables the students to review the subject matter they had difficulty with on the examination. Students are allowed to pace their education to the level and speed at which they can function most effectively.

Denney (1973) implemented a Question Pool Management System that depends on the identification of the question stem, the correct answers and the distracters for multiple choice items. The system permits an association of up to seven correct answers and seven distracters with each stem. If the instructor permits one or more of five choices on a test item to be correct, one question could serve as 137,720 distinguishable evaluation items. The system is flexible enough to handle most types of questions desired by the instructors and also allows storage for limited graphic material to be used with questions.

A computer assisted test assembly system was developed at Iowa State University (Menne, 1973). The system supported individual instructor's needs, minimized cost and provided item statistics and

analysis service. Instructors submitted test items to be keypunched and listed. The filed items with computer assigned serial numbers were used in printing master examination copy and separate answer key for items designated by the instructor. The typical cost for the computer time for retrieving the items and producing a master copy of a test with 70 items was about 75 cents.

Stodola (1973) and Toggenburger (1973) reported the use of computer assembled examinations within the California State University and College system. Through the use of telecommunication, the Classroom Teacher Support System provided production and scoring of examinations as an overnight service for faculty at San Diego State University, California State College and California State University. The question bank developed by Stodola (1973) for a counseling theory course contained 1500 items classified according to 400 behavioral objectives and cross-referenced with a reading assignment. With audiotaped lectures prepared for student use, the question bank became an integral part of a complete teaching package. Stodola (1973, p. 41) stated that

> perhaps the greatest strength of a computer-assisted test assembly is that it seems to represent a grass-roots movement in instruction, to a considerable extent initiated and supported by the classroom teacher himself.

Toggenburger (1973) described the procedures in the development of a question bank for United States history. Under the direction of a curriculum specialist, 20 experienced teachers and three clerks produced 8,000 test items that covered eight major units. Items were classified for retrieval by course number, category, difficulty (three levels), behavioral level (knowledge or application of knowledge), keyword and x-dimension (source or study aids).

The Test Item System developed by Remondini (1973) involved a seven step process: question selection, printout and answer card preparation, edit, duplication, administration of test, correction and updating of records. About 300 test items were accumulated for the question pool. Forms of test items included true-false, multiple-choice, essay, matching, and computation problems. Remondini reported a significant increase in accuracy of correcting examinations, fewer typographical errors, and a favorable reaction by students.

Related Research

Prior to 1959, students in all areas of home economics at Oklahoma State University were required to take the beginning clothing construction course, regardless of past experiences in the area of clothing. Since that time departmental pretests have been developed for the purpose of evaluating students' proficiency in clothing construction so that students could proceed to advanced sections or courses. Walsh (1959) conducted the first departmental study to develop a pretest for use in determining previous clothing construction experience of college students. Test items for the pencil and paper diagnostic pretest were related to six main content areas in clothing construction: art principles, elementary knowledge of textiles, pattern selection, use and adaptation to individual, sewing machine use and care and knowledge of construction processes. Degree of content validity was established for each test item. Students who earned the highest scores on the pretest were placed in a section of the basic clothing course where clothing construction was omitted. Walsh recommended that the pretest be used and analyzed for improvement.

In a study by Witt (1961), the Walsh Clothing Pretest was revised and a station-to-station practical examination was developed. The revised written pretest included discriminating items from Walsh's pretest, additional items and a new format which consisted of grouped matching, multiple-choice and true-false items. Witt's station-to-station practical examination was developed for evaluating the student's manipulative and judgmental skills pertaining to clothing construction and care. Instructions and materials for a specified problem were provided for the students at each station. Students were allowed 50 minutes to move to each of seven stations and perform the assigned tasks. The written pretest by Walsh and the station-to-station examination were administered to 112 freshmen clothing students enrolled at Mississippi State College for Women and Oklahoma State University. An item analysis was conducted on both examinations to determine which items were discriminating. Data from the item analysis showed that there were more discriminating items on the station-to-station examination than on the written examination.

Witt also developed and administered a questionnaire check list to use in determining previous clothing experiences of college freshmen. Responses to the questionnaire indicated that students entered college with varied clothing experiences. Witt recommended that further research be conducted to refine and develop devices for evaluating clothing competencies.

According to Berry (1963), pretest revisions by Witt were never actually implemented. Consequently the Walsh Clothing Pretest was used in the Clothing, Textiles and Merchandising Department from 1959 to 1963. In 1963, two studies were conducted for the purpose of

revising the pretests. Berry revised the paper and pencil pretest and Gould (1963) developed the laboratory performance examination. The two examinations were constructed to be used in conjunction with each other.

Berry's study focused on the revision of the original pretest developed by Walsh and revised by Witt. During fall of 1962, a pilot study was conducted with beginning clothing students. An item analysis of 49 pretests revealed that many of the items were not within difficulty and discrimination range considered desirable for an objective evaluative instrument. Further revision of the pretest was made according to suggestions and criticisms offered by faculty members who taught the basic clothing construction course. In spring 1963 the revised pretest was given to 76 students enrolled in basic clothing construction. Data obtained were used in correlating student performance on the revised instrument with the rank of student performance on the unrevised pretest and the final course grade. Mean scores made by beginning clothing students were similar on the pretest and revised instrument. The revised instrument appeared neither too difficult nor too easy. A correlation of .44 was calculated for pretest scores and final course grades. Berry recommended a revision of the test and the use of other evaluative instruments along with a written test.

Gould (1963) conducted a pilot study of 24 students to determine revisions for the station-to-station examinations. Three manipulative problems previously designed by Witt and six additional problems developed by Gould were included in the examination. Disadvantages of the station-to-station examination revealed during the pilot study were (1) confusion from constant movement of students, (2) traffic

congestion at stations, (3) shortage of supplies and (4) students influence on each others' work. Based on the results of the pilot test, five performance problems which portrayed the most discrimination power were selected for inclusion in the examination. The station-to-station method for administering the examination was changed. Students were required to check out a large manilla envelope which contained instructions, supplies and equipment needed for each of the five problems. The envelope was returned at the end of the hour. The revised performance examination was administered to 77 students enrolled in a basic clothing construction course. Benefits gained by revising the performance examination were reduction in the cost of administering the examination and elimination of time needed to set up the room. An item analysis was performed to determine difficulty and discrimination value. Scores on the performance examination were correlated with the written examination scores and a correlation coefficient of .70 was calculated. Analysis indicated that the scores on the two examinations were related to some degree, though a high score on one examination did not insure a high score on the other examination. Gould concluded that the examination had merit for aiding in placement of students in a basic college clothing course.

The research conducted by Walsh (1959), Witt (1961), Berry (1963) and Gould (1963) indicated that pretesting in the area of clothing construction for placement of students was more effective when a performance examination was used in addition to a written examination. Due to the increasing number of students and the time element involved in administering the examination, the laboratory examination was omitted after 1968.

Souligny (1971) evaluated the clothing exemption examination used by the Clothing, Textiles and Merchandising Department at Oklahoma State University. The examination was given to two groups of students. One group took the examination as a final examination and the second group took the examination for exemption purposes. Based on the data from the item analysis, Souligny reported that the examination was an acceptable measuring device, but the discriminating power of the examination was greater as an exemption examination than as a final examination. Students who achieved 85 percent or higher on the exemption examination were allowed to enroll in a more advanced clothing construction course. Only six students of the 267 students who took the exemption examination scored above the required 85 percent for exemption. Souligny recommended that the acceptable score for exemption be reconsidered.

A study on the development of an item pool from which selected advanced standing examinations could be compiled for use in basic clothing construction was conducted by Lisenby (1979). Scores from previously taken experience checklists and advanced standing examinations and from the practical assignments and written examinations were paired. A Pearson product-moment correlation coefficient was computed for each pair of scores to determine the degree of relationship. She found that the number of construction experiences did not necessarily relate to performance on a written examination in basic clothing construction. Results did reveal that scores made by students on practical assignments were significantly related to student performance on written examinations. Lisenby concluded that a practical examination may not be a necessary component of an advanced

standing examination when being used to assess knowledge and skill of students in basic clothing construction. Objectives for 24 topic areas were written and item analysis data from the written examination currently used in basic clothing construction were reviewed for selection of items for the item pool. A total of 571 test items were developed. The investigation of the feasibility of administering the advanced standing examination as a computer-generated examination was recommended.

Two studies were conducted at Oklahoma State University in the area of computer testing for clothing courses. Wilkins (1971) investigated the feasibility of using the computer to generate tests for the basic clothing selection course. Sixty-eight items were stored on a computer deck and 30 different forms of the examination, having 35 questions on each, were generated from items randomly selected from the item pool. The tests were printed on hard copy for administration to 141 students. Students answered the examination on separate sheets and answer sheets were hand-graded by the researcher. All students taking the computer-generated examination were asked to fill out a questionnaire concerning their attitudes toward the examination. When comparing the preference between the computer-generated examination and teacher made tests, 87 percent of the students preferred the computer-generated examination. The major complaint about the examination was the long length of computer pages as they were difficult to handle. The average cost per individual examination was $1.06.

The study by Good (1974) was conducted to determine how the video display terminal could be used successfully for computer-generated

testing in a basic clothing construction course. Two groups were used for the study: a control group of 26 students who took the final examination as a paper-and-pencil test and a group of 24 students who took the examination via the video display terminal. The computer randomly selected 100 items from 13 categories. Students completed an attitude questionnaire pertaining to the advantages and disadvantages of the computer-generated examination. Good found that students were as successful on the computer-generated examination as on the paper-and-pencil examination. Students preferred using light pens to the keyboard and felt the examination was easy to read on the terminal as well as fast to take. The cost was estimated at $1.20 per hour for connect time in addition to two cents per second of computer processor unit time. Recommendations were made to continue study on the administration of an advanced standing examination as a computer-generated examination.

Summary

The development and implementation of a computer-generated advanced standing examination begins with the identification of competencies. According to researchers, competencies identify knowledge, understanding, behaviors, skills and judgments the student should demonstrate that are considered essential for the performance in a given class. Examples of competencies for a basic clothing construction course were cited through various studies. Item pools for computer-generation begin with well developed test items based on subject matter objectives or competencies. Many researchers identified techniques for computer testing, however, most of the literature

related to computer selection of test items and printing of hard copy examinations rather than to student-computer interaction during the testing period. Primary considerations for computer testing were student satisfaction, instructor's convenience and computer costs. Research indicated that constant and continuous evaluation of curriculum and course content is essential in keeping examinations current with the times.

CHAPTER III

METHODS, PROCEDURES, AND ANALYSIS OF DATA

The problems addressed in the study were to determine competencies that are essential for a basic clothing construction course and to develop a computer-generated advanced standing examination based on these competencies. The methods, procedures, and data analysis used in conducting the study were described in this chapter. Objectives established for the study were to determine competencies for basic clothing construction considered essential by faculty of clothing departments in selected state universities and land grant colleges, to develop an item pool for a basic clothing construction examination based on the competencies identified by clothing faculty respondents, and to design a computer program to generate an advanced standing examination in basic clothing construction.

Research Design

The study consisted of three phases: determining competencies, developing an item pool, and implementing a computerized examination. The nature of the study required the use of a descriptive survey and instrument development methodology.

During the first phase of the study the survey method was used to determine competencies for basic clothing construction. Compton and Hall (1972, p. 139) described the survey research method as

"having the principal contribution of describing current practices or beliefs with the intent of making intelligent plans for improving conditions or processes in a particular local situation." Survey research is commonly used to obtain the opinions and attitudes of individuals (Kerlinger, 1964).

In collecting data for descriptive research, information should be carefully recorded from a variety of sources, such as the library, individuals and institutions, to give the investigator the most accurate, complete and current information (Hillway, 1969). Data derived through descriptive research can be helpful and meaningful in examining a situation or in preparing a new and better program. The competencies determined through the survey served as a basis for developing an item pool for the basic clothing construction examination.

For the second and third phases of the study an appropriate instrument development methodology was used in developing an item pool and implementing a computerized advanced standing examination for the basic clothing construction course at Oklahoma State University. Gronlund (1976) indicated that criterion-related mastery examinations include coverage of the minimum essentials of a course that must be mastered if the student is to be successful at the next level of instruction. An examination developed to measure the extent to which students have already achieved the objectives of planned instruction should be broad in scope, measure instructional objectives at various levels of complexity, and include items with a wider range of difficulty than other types of examinations. According to Gronlund (1976), an examination that measures intended outcomes of planned instruction

the student has already achieved is no different from the comprehensive examination given at the end of instruction.

The development of the computer-generated examination involved compiling test items based on pre-determined competencies for the basic clothing construction course. Items in the item pool were entered into the computer memory for use in test generation.

Phase I - Determining Competencies

The procedures for Phase I were designed to determine competencies for basic clothing construction considered essential by faculty of clothing departments in selected universities and land grant colleges. Through a review of literature, topic areas and suggested competencies for clothing construction were identified. These topic areas and suggested competencies were adapted and compiled in the form of a questionnaire for dissemination to professionals in the field of clothing, textiles and merchandising.

Population for Survey

The population selected for the survey included clothing faculty in member institutions of the National Association of State Universities and Land Grant Colleges that granted 15 or more bachelor degrees in textiles, clothing, and merchandising between September 1, 1978 and August 31, 1979 (Association of Administrators of Home Economics, 1979). Sixty-one of these colleges and universities had granted fifteen or more bachelor degrees in the area of textiles, clothing, and merchandising.

Survey Method

A mail survey was chosen as the least expensive way to obtain national representation. Though generally a researcher can expect a high non-response rate from a mail survey, the sample chosen consisted of educators who were likely to have a high interest in the survey results. Questionnaires are considered useful for collecting information when it is desirable to make an extensive sampling and when sources are not easily accessible to the teacher (The Indiana Home Economics Association, 1974). A cover letter attached to the questionnaire included a statement which explained the reason for the survey and the intended use of the information. The letter indicated that institutions from which completed questionnaires were returned would receive the results of the survey.

Development of Questionnaire

The questionnaire was designed to obtain three types of information from the respondents: (1) opinions on which of the suggested competencies would be essential for a basic clothing construction course, (2) ideas for additional topic areas and competencies, and (3) information on the use of evaluative instruments by their institutions for the purpose of pretesting, placement, exemption, advanced standing credit, or practical performance in clothing construction. Part I of the questionnaire included 83 suggested competencies in clothing construction that were listed under eleven topics. A variety of resources were investigated to determine the competencies that appeared on the questionnaire. Objectives and requirements for the basic clothing construction course taught at Oklahoma State University and the

topic areas and objectives in clothing construction cited by Lisenby (1979) and Miller (1971) were considered in the final selection of topic areas and competencies for questionnaire. A Likert-type scale was used for respondents to indicate the competencies they believed that the college student should become knowledgeable of in a basic clothing construction course.

Part II of the questionnaire contained three short-answer questions to identify additional topic areas or competencies respondents believed should be included, and to determine types of evaluative instruments in clothing construction that were being used in the institutions included in the survey.

Pretesting the Questionnaire

Prior to the distribution of the questionnaire, a pilot test was conducted to refine the instrument. Pilot testing involved 15 selected clothing faculty and graduate teaching assistants from Oklahoma colleges who were not included in the population used for the study. The instructions for evaluating the survey cover letter and questionnaire appear in Appendix A, p. 72. Participating faculty members completed the questionnaire and the evaluation form regarding clarity of wording, format, suitability of length, content and ease of completing the instrument. They made comments and suggestions that would improve the first draft of the instrument and the cover letter. After the pilot test was completed, forms were analyzed and the cover letter and questionnaire were revised as needed.

Collection of Data

An administrative representative of the Association of Administrators of Home Economics from each of the 61 institutions was sent a letter requesting assistance in selecting three faculty members with expertise in clothing construction to participate in the survey. Three copies of the questionnaire with attached cover letters and stamped self-addressed reply envelopes were enclosed to enable the respondents to readily return the data. Administrators were asked to disseminate the questionnaires to selected faculty members who consented to participate in the survey. Correspondence related to the survey appears in Appendix B, p. 74.

Each questionnaire (Appendix C, p. 78) was identified by a code number in order to determine which institutions needed follow-up reminders. The code numbers were also used to identify institutions that would receive results of the survey. Techniques used in an attempt to increase the response rate were the assurance of confidentiality, guarantee of follow-up information on the survey results, and the use of large orange envelopes for mailing the questionnaire.

Three questionnaires were mailed September 15, 1980, to each of the 61 selected administrators. By October 13, 1980, 125 of the 183 questionnaires had been completed and returned. A follow-up letter was written and mailed on October 14. An Oklahoma State University Pistol Pete cartoon was placed on the orange envelopes to attract the attention of the recipient. By November 7, 1980, 30 additional questionnaires had been received. At this time 57 of the 61 institutions were represented. A final reminder was made by telephone to the four administrators of institutions from which questionnaires had not been

received. Four additional questionnaires were received after this follow-up. Of the 183 questionnaires distributed a total of 160 (87.4 percent) questionnaires were returned and used in this study. Of the 61 institutions 60 (98.3 percent) were represented.

Data Analysis and Results

Data from the questionnaires were hand coded on Optical Mark Reader cards for computer analysis. Eighty-eight responses were coded for each questionnaire. The Apple II Disc System was used for data analysis. The cards were read into the computer and verified periodically for accuracy. Data from Part I of the questionnaires were analyzed to determine which of the 83 suggested competencies were considered essential by clothing experts. Responses were tabulated according to the method of summated ratings. The Likert-type scale consisted of the following alternatives and point values: strongly agree = 5, agree = 4, undecided = 3, disagree = 2, and strongly disagree = 1. A mean rating was calculated for each of the 83 competency statements by multiplying the value of the rating by the number of responses to the rating, summing the product and dividing by the total number of responses to the item.

Mean ratings for competency statements ranged from 2.60 to 4.93. Competencies with a mean rating of 3.50 or above were considered essential for basic clothing construction. Mean ratings for 77 (92.7 percent) of the 83 competencies were within the range of 3.50 to 5.00. As shown in Table I, the highest percentage of competencies (61.4 percent) had mean ratings within the range of 4.50-5.00.

TABLE I

RANGES OF MEAN RATINGS FOR 83 COMPETENCY STATEMENTS BY 160 CLOTHING FACULTY

Ranges of Mean Ratings	Number of Competencies	Percent
4.50-5.00	51	61.4
4.00-4.49	14	16.9
3.50-3.99	12	14.5
3.00-3.49	4	4.8
2.50-2.99	2	2.4
0-2.49	0	0.0

A frequency distribution of individual responses and mean ratings for each of the 83 competencies are listed in Appendix D, p. 85. Competency statements were arranged by topic area in descending order according to mean ratings in Appendix E, p. 88.

The following competencies had mean ratings less than 3.50 and were not considered essential for a basic clothing construction course.

2.3 Differentiate among fabric weaves

2.4 Identify the various fabric finishes

3.1 Determine criteria for selecting a sewing machine

8.6 Determine factors which influence whether to interline a garment

11.3 Recognize procedures for constructing a welt pocket

11.9 Identify procedures for making a self-fabric belt

Several respondents indicated that these competencies should be included in more advanced clothing construction courses.

Part II of the questionnaire contained two open-ended questions

that provided an opportunity for participants to suggest additional topic areas or competencies. Additional topic areas and competencies listed by respondents are found in Appendix F, p. 91. Suggested topic area and competencies were assessed by Oklahoma State University clothing faculty according to the following key:

A. Included within current list of essential topic areas and competencies

B. Included in advanced clothing courses

C. Not included in clothing construction courses at Oklahoma State University

D. Should be considered for inclusion in basic clothing construction course

Only three topic areas or competencies were suggested by more than four respondents. Several respondents indicated a need for a topic area and competencies related to fitting the garment in addition to competency 1.4 - Identify accepted methods for making alterations on patterns to improve fit. A few respondents suggested that waistbands and evaluation of quality construction be included.

For the final question on the survey, participants were asked to identify the various instruments used in their institutions to evaluate student competence in the area of clothing construction. The five types of instruments listed on the questionnaire were 1) pretest, 2) placement test, 3) exemption test, 4) advanced standing examination, and 5) practical performance test. A definition for each type of instrument was listed to provide a common understanding of instrument titles. Frequencies and percentage of responses were tabulated for each type of instrument. Responses of clothing faculty and use of

evaluative instruments in institutions represented in the study appear in Table II. Ninety-one clothing faculty, representing 46 institutions reported the use of an exemption test. Clothing faculty used a practical performance test in 42 institutions, an advanced standing examination in 36 institutions, a pretest in 32 institutions, and a placement test in 19 institutions. Data analysis of individual responses regarding each represented institution indicated that more than one type of instrument was used at most institutions.

Phase II - Developing an Item Pool

Procedures for Phase II were designed to develop an item pool for a basic clothing construction examination based on the competencies identified by clothing respondents. Good (1974) stated that the process of implementing a computerized examination requires the development of a pool of test items from which the computer can generate an examination.

Formulation of Test Items

One of the first steps in preparing a pool of items for an examination is to develop a grid that reflects the competencies and the amount of emphasis on each. Test items were constructed on the basis of the topic areas and competencies identified through the survey instrument. At least one item was developed for each of the competencies. The highest percent of test items were constructed at the knowledge level of the cognitive domain.

The assignment of items within topic areas to indicate the level of learning in the cognitive domain appears in Table III. A total of

421 items (84.2 percent) measured learning at the knowledge level, 48 items (9.6 percent) measured learning at the comprehension level, and 31 items (6.2 percent) measured learning at the application level.

TABLE II

USE OF EVALUATIVE INSTRUMENTS FOR CLOTHING CONSTRUCTION IN 60 INSTITUTIONS REPRESENTED BY 160 RESPONDENTS

Evaluative Instrument	Faculty Response	Percent	Number of Institutions	Percent
Exemption Test - Instrument used to determine extent of knowledge and skills for the purpose of allowing students to by-pass specific courses	91	56.9	46	76.7
Practical Performance Test - Instrument used to evaluate a student's abilities to perform processes involving manipulation of equipment and materials used in clothing construction	78	48.8	42	70.0
Advanced Standing Examination - Instrument used to grant college credit for a course based on an examination in lieu of enrollment in a course	65	40.6	36	60.0
Pretest - Instrument used to ascertain extent of knowledge of the subject prior to specific instruction	52	32.5	32	53.3
Placement Test - Instrument used to section students according to knowledge and skill in a subject	31	19.4	19	31.7

TABLE III

ASSIGNMENT OF ITEMS WITHIN EACH TOPIC AREA
TO LEVELS OF COGNITIVE DOMAIN[a]

Topic Area	Knowledge	Comprehension	Application	Total	%
(1) Pattern Selection and Preparation	60	8	6	74	14.8
(2) Fabric Selection and Preparation	47	15	6	68	13.6
(3) Sewing Equipment Selection, Care and Use	64	2	-	66	13.2
(4) Pressing Equipment and Techniques	30	1	-	31	6.2
(5) Basting and Machine Testing	47	2	13	62	12.4
(6) Seams and Seam Finishes	43	8	-	51	10.2
(7) Darts, Pleats and Gathers	34	-	-	34	6.8
(8) Facings, Interfacings and Linings	22	-	-	22	4.4
(9) Garment Closures	28	7	-	35	7.0
(10) Hem Construction	21	5	1	27	5.4
(11) Miscellaneous Construction Processes	25	-	5	30	6.0
Total	421 (84.2%)	48 (9.6%)	31 (6.2%)	500	100.00

[a]Since this is an introductory course, only the first three levels were measured.

Various resources were used in developing test items including textbooks, workbooks, course modules and written examinations for basic clothing construction currently being administered at Oklahoma State University. Resources used to develop test items and illustrations are listed in Appendix G, p. 95.

Ahman and Glock (1975) suggested the use of a test item file as a highly successful means of organizing pertinent information on examinations. A test item file consisting of item data cards for each test item was compiled. Each card included the course title, subject matter content, level of cognitive domain, coded information related to topic area, competency and item number, stem and alternative (Appendix H, p. 98). Due to limitations of the computer test scoring program, the item pool consisted of objective test items. The number and types of test items are categorized by topic area in Table IV. The 500 items included 378 multiple-choice items, 81 matching items and 41 true-false items. Six illustrations on pattern layout, pattern markings, fabric preparation, sewing machine parts, staystitching and small sewing and pressing equipment were designed to accompany the item pool.

Test Item Review

After the item pool was developed, six faculty members in the Departments of Clothing, Textiles and Merchandising and Home Economics Education and Community Services at Oklahoma State University reviewed the information on each of the item data cards. The researcher provided a list of criteria for developing test items and an evaluation form for professors to use in checking each item data card for sentence

structure, clarity, agreement of answer and appropriateness of distracters (Appendix I, p. 100). They also critiqued the data cards to determine whether the test item was listed by appropriate topic area and competency. The researcher reviewed the evaluation forms and item data cards and made appropriate revisions in order to improve the items before using them in sample examinations. Most corrections were related to typing errors, misspelled words, clarity, and ambiguity.

TABLE IV

TEST ITEMS CATEGORIZED ACCORDING TO NUMBER AND TYPE WITHIN EACH TOPIC AREA

Topic Area	Type of Item: Multiple Choice	Matching	True False	Total
(1) Pattern Selection and Preparation	56	12	6	74
(2) Fabric Selection and Preparation	51	12	5	68
(3) Sewing Equipment Selection, Care and Use	34	31	1	66
(4) Pressing Equipment and Techniques	16	13	2	31
(5) Basting and Machine Testing	45	13	4	62
(6) Seams and Seam Finishes	49	-	2	51
(7) Darts, Pleats and Gathers	28	-	6	34
(8) Facing, Interfacing and Linings	19	-	3	22
(9) Garment Closures	31	-	4	35
(10) Hem Construction	19	-	8	27
(11) Miscellaneous Construction Processes	30	-	-	30
Total Items	378	81	41	500

Administration of Sample Examinations

After the test items were revised, items were formed into six sample examinations labeled A through F and administered for the purpose of analyzing the 500 test items and comparing examination statistics. Examinations were used with students enrolled in the basic clothing construction course at Oklahoma State University in the fall of 1980 and spring of 1981. Most of the students were majoring in clothing, textiles and merchandising or home economics education and community services. In the 1980 fall semester, 74 students took a 100 item final examination for the basic clothing construction course. Thirty-eight students took Form A and 36 students took Form B. For the 100 item final examination given in the 1981 spring semester, 31 students took Form C and 27 students took Form D. A 50 item unit examination was also administered during the spring, 1981; 23 students took Form E and 29 took Form F.

Each form of the examination contained items randomly assigned within each of the 11 topic areas. On the last page of the examination, students were asked to list the numbers of any test items that were difficult to understand or that they felt were not included in the course objectives. Students marked answers on mark-sense sheets for machine scoring.

Analysis of Sample Examinations

The purpose of analyzing the six forms of sample examinations was to check for relationships among the forms. Mean, standard deviation, range, reliability, standard error, mean difficulty and mean discrimination were calculated for each form. Examination forms A, B, C,

and D were compared separately from forms E and F due to the difference in the number of test items. Results of the examination are summarized in Table V.

TABLE V

COMPUTED RESULTS OF SIX WRITTEN EXAMINATIONS ADMINISTERED TO STUDENTS IN BASIC CLOTHING CONSTRUCTION COURSES

	Forms of Examination					
	A	B	C	D	E	F
Number of test items	100	100	100	100	50	50
Number of examinations administered	38	36	31	27	23	29
Mean	68.61	65.08	60.94	63.93	31.43	32.76
Standard deviation	8.60	13.13	10.26	8.50	4.76	4.14
Range	36	61	51	29	24	18
Reliability	0.81	0.91	0.85	0.79	0.69	0.57
Standard error	3.78	3.95	3.98	3.87	2.63	2.64
Mean difficulty	68.60	65.08	60.93	63.93	62.87	65.52
Mean discrimination	0.21	0.31	0.25	0.20	0.23	0.20

An investigation of the examination statistics indicated that the six forms of examinations were comparable. Means and mean difficulties for the four 100-item examinations were within the range of 60.93 to

68.60. Except for Form C, the sample examinations were all within the optimal difficulty level (63 to 74) recommended by Sax (1980) for a 100-item examination with four alternatives. Since the examinations included about seven true-false items the optimal difficulty level might be slightly higher. Sax recommended an optimal difficulty level of 75 to 85 for true-false examinations.

The ranges of student scores for the 100-item examinations varied from 29 on Form D to 61 on Form B. The wide range of scores was responsible for a larger standard deviation for the 100-item examinations. Forms E and F had similar standard deviations. There was little variance in the standard error of measurement among Forms A, B, C, and D and almost identical standard error scores were found for Forms E and F.

Reliability of the examinations was determined through a Kuder Richardson formula 8 statistical analysis. According to Nunnally (1972) reliability coefficients for final examinations should be at least as high as .75. The reliability coefficients for the 100-item examinations were all high. The lower coefficients for Form E and Form F may be attributed to the use of only 50 test items.

Mean discrimination indices were moderately consistent. Discrimination indices, however, are not considered important in relation to criterion-referenced examinations (Sax, 1980).

Item Analysis

An analysis of responses to each test item was conducted to determine the effectiveness of the item. The discrimination index and difficulty level for each of the 500 items are found in Appendix J,

p. 103. The discrimination indices of the items varied from +0.69 to -0.36. The 205 items with a discrimination index below +0.20 were examined closely for possible revision. The difficulty level of items ranged from 3.45 percent (extremely hard) to 100.00 percent (extremely easy). Fourteen items correctly marked by all students resulted in a difficulty level of 100.00 percent. According to divisions of difficulty identified by Ahmann and Glock (1959), items were designated as easy, medium, or hard level of difficulty. Table VI shows that 45.4 percent of the items fell within the easy level, 37.2 percent of the items fell within the medium level, and 17.4 percent of the items fell within the hard level of difficulty.

TABLE VI

SUMMARY OF RATINGS FOR DIFFICULTY LEVEL OF 500 TEST ITEMS

Rate	Range for Rate	Number of Items	Percent of Total Items
Easy	0.00 to 39.99	227	45.4
Medium	40.00 to 70.99	186	37.2
Hard	71.00 to 100.00	87	17.4
Totals		500	100.00

Test items were evaluated on the basis of difficulty, discrimination, student reactions to readability and clarity of items, and frequency count of the number of times each distracter was chosen in order to determine whether changes were needed to improve items. Revisions were made on 98 test items. Changes made included restating negative stems, correcting grammatical errors, improving clarity or meaning, selecting different distracters and shortening length of items.

Scores on the basic clothing construction examination were compared with scores on practical assignments for students enrolled in the basic clothing construction course in the fall, 1980, and spring, 1981. The Pearson product-moment correlation coefficient was calculated to determine the degree of relationship between the examination scores and the practical assignment scores. A practical assignment score was calculated for each of the 130 students by averaging the two practical assignments required for the course. The practical assignment included the construction of a dress (female students) or shirt (male students) and completion of a notebook containing samples of designated construction techniques. Results of the analysis were used to determine whether any correlation existed between the basic clothing construction examination and practical performance skills in clothing construction.

Written examination scores and practical assignment scores were paired and coded from 1 to 130 (Appendix K, p. 110). All students scored higher on the practical assignments than on the written examinations. Results of the correlation (Table VII) indicated a significant relationship between the two sets of scores ($r = .37$, $p < .0001$).

TABLE VII

PEARSON PRODUCT-MOMENT CORRELATION OF WRITTEN EXAMINATION SCORES WITH PRACTICAL SCORES (N=130)

Variables	Mean	Standard Deviation	Pearson r	Significance Level
Written Examination Scores	65.65	9.74	.37	.0001
Practical Examination Scores	94.02	5.27		

Phase III - Implementing a Computerized Examination

The procedure and data analysis for Phase III involved the development of a computer program to generate an advanced standing examination in basic clothing construction. The advanced standing examination for the basic clothing construction course was developed for computer generation using facilities available in the Oklahoma State University Computer Center and Home Economics West. The purpose of the examination was to assess the student's level of proficiency in the area of basic clothing construction.

Computer Program Design

The applications programmer at the Oklahoma State University Computer Center in consultation with the researcher developed the computer program for the advanced standing examination using Program Language 1 (PL 1). The item pool formed a data base from which the

individual advanced standing examinations were generated by the computer. Test items based on the competencies established through the survey were coded by module number, topic area number, and test item number. The eleven topic areas were:

1. Pattern selection and preparation
2. Fabric selection and preparation
3. Sewing equipment, selection, care and use
4. Pressing equipment and techniques
5. Basting and machine stitching
6. Seams and seam finishes
7. Darts, pleats and gathers
8. Facings, interfacings and linings
9. Garment closures
10. Hem construction
11. Miscellaneous construction processes

The item, alternatives and correct answers were keyed in on the computer. Two instructors who taught the basic clothing construction course at Oklahoma State University reviewed a hard copy printout of the instructions and test items to check for errors. Reported errors were corrected on the computer. Of the 500 test items, 243 were specified for Module I and 257 for Module II.

In addition to generating and scoring the examinations, the computer program was designed to include the capacity to add new topic areas; add, change, or delete test items; change the number of test items within categories; and change the number of items in the examination. The program and test items were stored on an IBM 3350 Disk Pack, with a back-up recorded on magnetic tape. The researcher entered the

topic number and items into the computer memory and specified how many items were to be selected from each topic area. An example of the format for item selection is shown below.

Topic Areas	1	2	3	4	5	6	7	8	9	10	11	Total
Total Number of Items per Area	74	68	66	31	62	51	34	22	35	27	30	500
Number to be Selected for Examination	15	14	13	6	12	10	7	4	8	5	6	100

Coded information concerning a student's examination was recorded in the following format and includes topic area, question number, correct answer and student response for each item.

Topic Area	Question Number	Correct Answer	Student Response
01	013	A	B

Another capability of the computer program was the ability to store all students' scores by identification number. The instructor can then ask for a printout of students' scores. The following is an example of scoring for a student who took the examination.

ID Number	Right Answers	Wrong Answers	Score
349176	R=82	W=18	82

Administration of the Computerized Examination

Before the actual implementation of the computer-generated advanced standing examination, eight students who were enrolled in the basic clothing construction course volunteered to take the examination on the computer. They set dates and times for their examinations and reserved computer terminals.

Administering the computerized examination was a simple process. The researcher logged on to the terminal for the student in order to

insure the security of codes used to access the examination. A folder with six illustrations on pattern layout, pattern markings, fabric preparation, sewing machine parts, staystitching, and small sewing and pressing equipment was provided for use with selected test items.

The student was seated in front of the terminal. When the computer received the proper message, the following instructions were displayed on the screen:

MODULE 1 COMPUTER TEST

ENTER YOUR STUDENT ID NUMBER

After the student entered an identification number the computer printed the following instructions for taking the examination.

READ EACH QUESTION CAREFULLY.

TYPE THE LETTER (A, B, C, D) WHICH BEST REPRESENTS YOUR CHOICE OF RESPONSE.

PRESS THE "RETURN" KEY.

THE COMPUTER WILL DISPLAY YOUR SELECTION AND ASK YOU TO TYPE "YES" OR "NO" TO VERIFY YOUR RESPONSE.

- IF YOU ARE SATISFIED WITH YOUR RESPONSE, TYPE IN "YES" THEN HIT "RETURN OR ENTER".
- IF YOU WISH TO CHANGE YOUR RESPONSE, TYPE "NO" HIT "RETURN OR ENTER" THEN TYPE IN YOUR NEW RESPONSE.

UPON COMPLETION OF THE EXAMINATION THE COMPUTER WILL DISPLAY "END OF TEST: YOUR SCORE IS _____".

HIT "RETURN OR ENTER" TO BEGIN EXAMINATION.

GOOD LUCK!!

The computer was programmed to select 100 test items from the set of items specified for Module I used in the basic clothing

construction course. After the student completed the examination, the computer displayed the score, requested the student to return the examination folder to the Clothing, Textiles, and Merchandising Department, and automatically logged off. Information concerning the examination was recorded. The topic area, item number, correct answer, and student response for each test item was printed on hard copy at the University Computer Center and made available for the researcher to use in discussing the examination with the student and for use in item analysis.

Analysis of the Computer-Generated Examination

Table VIII shows the examination scores and the time required for taking the examination. Scores ranged from 72 to 91. The amount of time needed to take the examination varied from one hour and 25 minutes to two hours and 5 minutes.

TABLE VIII

EXAMINATION SCORES AND TIME UTILIZED FOR THE ADVANCED STANDING EXAMINATION

Student Examination Numbers	Examination Scores	Time
1	91	1 hour/35 minutes
2	85	1 hour/35 minutes
3	72	1 hour/50 minutes
4	76	1 hour/45 minutes
5	70	2 hours/5 minutes
6	70	2 hours/0 minutes
7	80	1 hour/25 minutes
8	72	1 hour/37 minutes

A chart was developed to determine the number of times each item was selected by the computer. A pattern of the 100 items generated for Module I for each of the eight examinations is shown in Appendix L, p. 112. Of the possible 243 items, 228 were selected at least one time during the eight examinations generated.

Computer Testing Problems

The researcher observed the eight students as they took the examination to see if they had difficulty in interpreting directions and to be available in case problems occurred with the computer. Problems occurred while two students were taking the computer-generated examinations. As one student took the examination, the computer automatically logged off after generating only 42 items. The applications programmer discovered that all the items listed after the fourth topic area had been inadvertently deleted from the item pool in the computer memory. This probably occurred by accident during an editing session. Since items were recorded on a back-up tape, the programmer completed all the necessary steps to allow the student to continue the examination at a later date. Separate printouts for her responses to the first 42 items (topic areas 1 to 4) and the final 68 items (topic areas 5 to 11) were used to compute the final score.

During another student's examination the computer logged off because the number of one particular item selected by the computer had never been programmed into computer memory or had been deleted accidently during editing. This problem was corrected by entering the item on the computer. The student then continued the examination, however, she accidently pressed the "break" key on the terminal. This

sent the message to the computer that she wanted to leave the program, so all of the responses that she entered following the first time she was logged off were completely lost. Since this problem could not be corrected, students were cautioned to be extremely careful when touching the keyboard and never to press the "break" key. Six of the students completed the examinations with no problems with the computer.

Discussion

Students gave several suggestions for improving the computerized examination. All eight students recommended that the test items be numbered from one to one hundred as they appeared on the screen. The items were displayed without numbers, and students did not know how many items they had answered until their final scores appeared on the terminal. The students also suggested a larger illustration of the sewing machine, and a clearer placement of letters that referred to sewing and pressing equipment on another illustration. Even though most of the students had never experienced the use of a computer terminal, they had no problems interacting with the computer. Several students commented that taking the examination on the computer was very convenient and they liked the idea of knowing their scores immediately.

Administering the computer-generated examination took less time for the faculty member than a traditional written examination. After students were logged on to the computer(a five-minute process) the instructor could leave. Security of the examination was no problem as students are logged on by a faculty member and are automatically logged off.

Computer costs were feasible for administering the examination. The average cost was about $3.85 per examination. Cost of programming (a one-time cost) was approximately $300.00.

By pretesting items through the administration of sample examinations, test items were revised to increase reliability and validity for the computer-generated examination. Relating test items to specific topic areas and competencies also increased the degree of validity and reliability. Though the item pool presently consists of 500 items, additional test items would allow less repetition of items on the generated examinations.

The item selection pattern from the eight generated examinations indicated an inadequacy in randomizing selected items in topic area 3 (Appendix L, p. 112). Ten items were picked for every examination and fifteen were never selected. The computer program should be analyzed and revised to correct this problem.

The researcher identified the following recommendations for further development of the examination:

1. Program the computer to select equal numbers of items from easy, medium and hard levels of difficulty within the topic areas to increase reliability of examination.
2. Revise random number process for computer program in order to improve adequacy of item selection.
3. Revise the computer program so that individual items will be numbered sequentially as they appear in the test.
4. Refine the format of the illustrations for clarity.
5. Develop additional test items for the item pool especially at the comprehension and application levels of the cognitive

domain. The number of items in each topic area should be proportional to the amount of emphasis placed on that topic area in the course.

6. Consider whether additional topic areas or competencies suggested by clothing faculty respondents, such as fit of the garments, evaluation of quality, and waistbands, should be included in the basic clothing construction course.
7. Review and update topic areas, competencies and test items as needed to stay relevant with the changing technology of clothing and textile industries.

CHAPTER IV

SUMMARY, CONCLUSIONS, AND RECOMMENDATIONS

The research was conducted to determine essential competencies for a basic clothing construction course for use in the development and implementation of a computer-generated advanced standing examination at Oklahoma State University. The specific objectives for the study were to determine competencies for basic clothing construction considered essential by faculty of clothing departments in selected state universities and land grant colleges; develop an item pool for a basic clothing construction examination based on the competencies identified by clothing faculty respondents; and design a computer program to generate an advanced standing examination. The study required utilization of a descriptive survey and instrument development methodology.

Summary of Findings

During the first phase of the study a questionnaire was designed to identify essential competencies for a basic clothing construction course. Selected clothing faculty in the 61 member institutions of the National Association of State Universities and Land Grant Colleges that granted 15 or more bachelors degrees in clothing, textiles and merchandising between September 1, 1978 through August 31, 1979 were surveyed. Responses from 160 participants representing 60 institutions

were used in the analysis of data. Frequencies and mean ratings were calculated for each of the 83 competency statements listed by topic area. The 77 competencies determined essential were used as a basis for the item pool developed for the advanced standing examination. Frequencies were tabulated for evaluative instruments used by clothing faculty. Sixty percent of the institutions surveyed used some form of advanced standing examination for accelerating students.

During the second phase of the study an item pool was developed. Test items were categorized by topic areas and competencies. A total of 500 items were analyzed through a series of written examinations administered to students enrolled in the basic clothing construction courses during the fall semester of 1980 and the spring semester of 1981. The item analysis was used to determine test items that needed revision. Written examination scores and scores on two performance assignments were paired to determine the degree of relationship by using the Pearson product-moment correlation coefficient. A correlation coefficient of .37 ($p < .0001$) was calculated.

The computer-generated advanced standing examination was implemented during the final phase of the study. The applications programmer in consultation with the researcher at Oklahoma State University designed a computer program to generate, score and analyze the examination. After revisions were completed on test items, items were entered on the computer. A folder with six printed illustrations was used as a supplement to aid in answering specified items. Eight students took the computer-generated advanced standing examination during January, 1982.

Conclusions

Research in the development of a computer-generated advanced standing examination in basic clothing construction supported the following conclusions:

1. Clothing faculty in selected state universities and land-grant colleges were homogeneous in their ideas about which competencies were considered essential for a basic clothing construction course.
2. The computer-generated advanced standing examination is effective for the purpose of evaluating student attainment of specified competencies in basic clothing construction and can be used for the purpose of awarding credit and/or advancing students.
3. Results of the study indicated that student scores on performance assignments were moderately related to student performance on written examinations.
4. The process of administering the examination via the computer was very acceptable to both students and faculty.

Recommendations for Research and Development

The methods used in conducting this research and information gained from this study can be used to identify competencies, develop item pools and implement computerized advanced standing examinations for other selected courses in various subject matter areas. Findings related to competencies determined essential for a basic clothing construction course may prove helpful in aiding clothing, textiles

and merchandising administrators and faculty members in curriculum development and instructional planning.

The following recommendations for further research and development are suggested:

1. Replicate Phase I of the study for other clothing construction courses to provide a sequential advancement of essential competencies and to prevent duplication of competencies.
2. Use the items to construct final examinations in the course and conduct a longitudinal study to calculate correlation scores and construction techniques notebook scores.
3. Continue analysis of student scores on the advanced standing examination to identify topic areas and competencies in which students have missed the highest percentage of test items. These topic areas and competencies could be prioritized for special emphasis in instructional planning for the basic clothing construction course.
4. Conduct an item analysis using a larger number of scores. These data could be obtained through computer printouts from the advanced standing examination and computer scored examinations from the basic clothing construction course that contain test items from the item pool. Data from scores over a longer period of time could be used to increase the reliability of the item analysis.
5. Conduct further analyses for reliability by administering three computer examinations to each student and comparing examination results.

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APPENDICES

APPENDIX A

INSTRUCTIONS FOR EVALUATING THE FIRST DRAFT OF COVER LETTER AND QUESTIONNAIRE

OKLAHOMA STATE UNIVERSITY

Department of Clothing, Textiles & Merchandising
Stillwater, Oklahoma 74078

MEMORANDUM

DATE: August 29, 1980

TO: Persons with expertise in clothing construction or evaluation

FROM: Tana Stufflebean - 309 HEW - OSU

SUBJECT: Pretest - Research Questionnaire Review

Your participation in reviewing the enclosed cover letter and questionnaire designed to identify competencies for basic clothing construction is needed. Your comments and suggestions will be used in making final revisions for the instrument.

DIRECTIONS:

1. Read the cover letter
2. Complete the written questionnaire
3. List any comments or suggestions for improvement of the cover letter or questionnaire in the following areas:
   A. Clarity of the cover letter
   B. Format of the questionnaire
   C. Clarity of the definition of competency, general directions, topic areas and competencies
   D. Any additional comments or suggestions (list on the cover letter, the questionnaire or on the back side of this page).

THANK YOU FOR YOUR ASSISTANCE . . . . PLEASE RETURN AS SOON AS POSSIBLE

APPENDIX B

CORRESPONDENCE USED IN SURVEY

OKLAHOMA STATE UNIVERSITY

Department of Clothing, Textiles & Merchandising
Stillwater, Oklahoma 74078

September 15, 1980

The enclosed questionnaires constitute an important segment of research conducted in the Clothing, Textiles and Merchandising Department at Oklahoma State University. The purpose of the survey is to determine the essential competencies for basic clothing construction in order to develop and implement an advanced standing examination for the beginning clothing construction course.

The institution you represent is one of 61 member institutions of the National Association of State Universities and Land Grant Colleges that granted 15 or more Bachelor of Science degrees in the area of textiles, clothing and merchandising from September 1, 1978 through August 31, 1979. As an institutional representative in the Association of Administrators of Home Economics in State Universities and Land Grant Colleges (AAHE), your assistance is needed to disseminate the enclosed questionnaires to faculty members who teach clothing construction in your institution.

Please ask three faculty members with expertise in clothing construction to respond to the survey and return the completed questionnaires in the attached envelopes by October 1, 1980. The code number assigned is for internal processing only and in no way will your department or institution be identified by name after the questionnaire is returned. All personal comments will be held in strict confidence.

In appreciation for your assistance with the study, the survey results will be sent to those institutions from which completed questionnaires are received. Thank you very much for your participation and if we can be of any service to you, please call on us.

Sincerely,

Tana Stufflebean
Assistant Professor

Grovalynn Sisler, Professor and Head
Clothing, Textiles and Merchandising Department

OKLAHOMA STATE UNIVERSITY

DEPARTMENT OF CLOTHING, TEXTILES & MERCHANDISING
STILLWATER, OKLAHOMA 74078

September 15, 1980

Dear Colleague:

The attached questionnaire constitutes an important segment of research being conducted in the Clothing, Textiles and Merchandising Department at Oklahoma State University. The purpose of the survey is to determine the essential competencies for basic clothing construction in order to develop and implement a written advanced standing examination for the beginning clothing construction course.

As a selected faculty member with expertise in clothing construction, please respond to the survey and return the completed questionnaire in the attached envelope by October 1, 1980. The code number at the top of the questionnaire is for identifying which questionnaires have been returned. Your department or institution will not be identified by name and all personal comments will be held in strict confidence.

In appreciation for your participation in the study, the survey results will be sent to the participating institutions after the research has been completed. Thank you very much for taking part in the research.

Sincerely,

Tana Stufflebean
Assistant Professor

Grovalynn Sisler, Professor and Head
Clothing, Textiles and Merchandising Department

OKLAHOMA STATE UNIVERSITY

DEPARTMENT OF CLOTHING, TEXTILES & MERCHANDISING
STILLWATER, OKLAHOMA 74078

October 14, 1980

Earlier this fall you were sent questionnaires to determine the essential competencies for basic clothing construction courses. At this point we have not received any responses from your institution. If responses have been returned we appreciate them. If not, duplicate questionnaires are enclosed. Please have three faculty members with expertise in clothing construction respond to the survey and return the completed questionnaires.

The response has been excellent and much valuable information has been gained. However, we are striving to receive information from as many teachers as possible and hope that you will assist us in gaining these responses.

In appreciation for your assistance with the study, the survey results will be sent to those institutions from which completed questionnaires are received. Thank you very much for your participation.

Sincerely,

Tana Stufflebean
Assistant Professor

Grovalynn Sisler, Professor and Head
Clothing, Textiles and Merchandising Department

APPENDIX C

QUESTIONNAIRE

Code

QUESTIONNAIRE: BASIC CLOTHING CONSTRUCTION COMPETENCIES

DEFINITION: A competency is an outcome of education that the individual should attain in a given course.

PART I

GENERAL DIRECTIONS: Various clothing construction courses are offered at the college level. To determine which competencies you believe should be required in a one semester college level basic (beginning) clothing construction course, please circle one of the symbols following each competency. Competencies are listed in 11 topic areas.

KEY:
SA - Strongly Agree
A - Agree
U - Undecided
D - Disagree
SD - Strongly Disagree

TO EARN COLLEGE CREDIT FOR THE BASIC CLOTHING CONSTRUCTION COURSE, THE STUDENT WILL BE ABLE TO:

		Strongly Agree	Agree	Undecided	Disagree	Strongly Disagree
	(1) PATTERN SELECTION AND PREPARATION					
1.1	Select appropriate pattern sizes and types for various body descriptions and given measurements	SA	A	U	D	SD
1.2	Utilize metric measurements indicated on patterns	SA	A	U	D	SD
1.3	Identify techniques in preparing a pattern for pattern layout . . .	SA	A	U	D	SD
1.4	Identify accepted methods for making alterations on patterns to improve fit	SA	A	U	D	SD
1.5	Recognize the procedure for relocating darts	SA	A	U	D	SD
1.6	Recognize procedures for adhering a pattern to the fabric	SA	A	U	D	SD
1.7	Identify markings that appear on patterns or pattern guides	SA	A	U	D	SD
1.8	Determine appropriate methods of transferring pattern markings to selected fabrics	SA	A	U	D	SD

TO EARN COLLEGE CREDIT FOR THE BASIC CLOTHING CONSTRUCTION COURSE, THE STUDENT WILL BE ABLE TO:

		Strongly Agree	Agree	Undecided	Disagree	Strongly Disagree
	(2) FABRIC SELECTION AND PREPARATION					
2.1	Apply art elements and principles of design in selecting fabrics for different figure types/physiques	SA	A	U	D	SD
2.2	Define terminology related to fiber, yarn and fabric	SA	A	U	D	SD
2.3	Differentiate among fabric weaves	SA	A	U	D	SD
2.4	Identify the various fabric finishes	SA	A	U	D	SD
2.5	Determine which fabrics are most suitable for specific garments	SA	A	U	D	SD
2.6	Identify appropriate notions for selected garments	SA	A	U	D	SD
2.7	Recognize what factors influence the amount of yardage required	SA	A	U	D	SD
2.8	Identify methods for straightening the grain of fabric	SA	A	U	D	SD
2.9	Recognize the process of preparing fabric for pattern layout	SA	A	U	D	SD
2.10	Identify fabrics which require a one way (nap/pile) layout	SA	A	U	D	SD
2.11	Identify techniques for cutting fabric	SA	A	U	D	SD
	(3) SEWING EQUIPMENT SELECTION, CARE AND USE					
3.1	Determine criteria for selecting a sewing machine	SA	A	U	D	SD
3.2	Determine criteria for selecting small equipment	SA	A	U	D	SD
3.3	Recognize the process of threading a sewing machine	SA	A	U	D	SD
3.4	Recognize the functions of selected parts of a sewing machine	SA	A	U	D	SD
3.5	Recognize factors which influence tension and stitch length	SA	A	U	D	SD
3.6	Identify the procedures for cleaning and/or oiling the sewing machine	SA	A	U	D	SD
3.7	Differentiate among names and purposes of small sewing equipment	SA	A	U	D	SD
	(4) PRESSING EQUIPMENT AND TECHNIQUES					
4.1	Identify the types of pressing equipment	SA	A	U	D	SD
4.2	Describe the purpose of selected pressing equipment	SA	A	U	D	SD
4.3	Determine appropriate pressing equipment and procedures for specific fabrics and construction techniques	SA	A	U	D	SD
4.4	Select correct iron heat and moisture settings for pressing specific fabrics	SA	A	U	D	SD
4.5	Differentiate between pressing and ironing	SA	A	U	D	SD
4.6	Identify correct procedure for using presscloths	SA	A	U	D	SD

TO EARN COLLEGE CREDIT FOR THE BASIC CLOTHING CONSTRUCTION COURSE, THE STUDENT WILL BE ABLE TO:

		Strongly Agree	Agree	Undecided	Disagree	Strongly Disagree
	(5) BASTING AND MACHINE STITCHING					
5.1	Identify the purpose of basting	SA	A	U	D	SD
5.2	Differentiate among techniques used for pin basting, hand basting and machine basting	SA	A	U	D	SD
5.3	Describe the use of fabric glue and fusible webs	SA	A	U	D	SD
5.4	Determine what factors influence the method of basting to be used.	SA	A	U	D	SD
5.5	Differentiate among types of stitching (reinforcement stitching, understitching, easestitching, edge stitching and staystitching, directional stitching, top stitching)	SA	A	U	D	SD
5.6	Determine the procedure for directional stitching in selected areas of construction (darts, zippers, staystitching)	SA	A	U	D	SD
5.7	Differentiate between the length of machine stitch to be used for basting, reinforcement stitching and regular stitching	SA	A	U	D	SD
	(6) SEAMS AND SEAM FINISHES					
6.1	Determine the characteristics of a plain seam	SA	A	U	D	SD
6.2	Differentiate among the following types of seams: flat-fell, mock flat-fell, true French, false French and lapped	SA	A	U	D	SD
6.3	Identify the purpose of a seam finish.	SA	A	U	D	SD
6.4	Identify various seam finishes (zigzagged, hand overcast, bound, pinked and clean finished	SA	A	U	D	SD
6.5	Determine factors which influence the choice of a seam finish.	SA	A	U	D	SD
6.6	Identify placement and purpose of trimming, grading and notching	SA	A	U	D	SD
	(7) DARTS, PLEATS AND GATHERS					
7.1	Describe the procedure for stitching darts	SA	A	U	D	SD
7.2	Determine factors which influence technique used in pressing darts	SA	A	U	D	SD
7.3	Select the most suitable method of pressing darts for specified fabrics	SA	A	U	D	SD
7.4	Identify types of pleats and methods of constructing pleats.	SA	A	U	D	SD
7.5	Identify the procedure for constructing gathers.	SA	A	U	D	SD

TO EARN COLLEGE CREDIT FOR THE BASIC CLOTHING CONSTRUCTION COURSE, THE STUDENT WILL BE ABLE TO:

		Strongly Agree	Agree	Undecided	Disagree	Strongly Disagree
	(8) FACINGS, INTERFACINGS AND LININGS					
8.1	Differentiate among the definitions of facings, interfacings, linings, interlinings and underlinings	SA	A	U	D	SD
8.2	Distinguish between an extended facing and an applied facing	SA	A	U	D	SD
8.3	Select appropriate methods of attaching interfacing to specified areas	SA	A	U	D	SD
8.4	Identify the different types of interfacing.	SA	A	U	D	SD
8.5	Determine factors which influence the choice of interfacings	SA	A	U	D	SD
8.6	Determine factors which influence whether to interline a garment	SA	A	U	D	SD
8.7	Determine factors which influence whether to line or underline a garment	SA	A	U	D	SD
	(9) GARMENT CLOSURES					
9.1	Differentiate between lapped and centered zipper construction.	SA	A	U	D	SD
9.2	Identify appropriate placement of zipper according to type of zipper application and garment area	SA	A	U	D	SD
9.3	Recognize the correct sequence for inserting a zipper	SA	A	U	D	SD
9.4	Select correct type of button holes (fabric bound, fabric loop or machine worked) for specified uses	SA	A	U	D	SD
9.5	Identify criteria for a quality buttonhole	SA	A	U	D	SD
9.6	Define "bight" in relation to a buttonhole	SA	A	U	D	SD
9.7	Relate size and shape of button to length of buttonhole	SA	A	U	D	SD
9.8	Differentiate between buttons with and without shanks.	SA	A	U	D	SD
9.9	Identify the purpose and procedure for sewing on a button using a thread shank	SA	A	U	D	SD
9.10	Determine factors which influence the choice of buttons for a garment	SA	A	U	D	SD
9.11	Select the appropriate fastener for specified situations	SA	A	U	D	SD
9.12	Identify the correct procedure for attaching snaps, hooks and eyes	SA	A	U	D	SD

TO EARN COLLEGE CREDIT FOR THE BASIC CLOTHING CONSTRUCTION COURSE, THE STUDENT WILL BE ABLE TO:

		Strongly Agree	Agree	Undecided	Disagree	Strongly Disagree
	(10) HEM CONSTRUCTION					
10.1	Identify factors which influence length of garment	SA	A	U	D	SD
10.2	Determine hem width for specified fabrics and garment styles	SA	A	U	D	SD
10.3	Recognize correct process for preparing garment for a hem.	SA	A	U	D	SD
10.4	Identify various types and uses of hem finishes.	SA	A	U	D	SD
10.5	Identify fusing techniques and products used for hemming purposes. .	SA	A	U	D	SD
	(11) MISCELLANEOUS CONSTRUCTION PROCESSES					
11.1	Identify procedures for setting a sleeve in a garment.	SA	A	U	D	SD
11.2	Determine the criteria for quality collars	SA	A	U	D	SD
11.3	Recognize procedures for constructing a welt pocket.	SA	A	U	D	SD
11.4	Recognize procedures for preparing and attaching a patch pocket	SA	A	U	D	SD
11.5	Recognize procedures for inserting a pocket in a seam.	SA	A	U	D	SD
11.6	Identify the procedure for preparing and attaching cuffs to a garment	SA	A	U	D	SD
11.7	Determine procedure for constructing bias bindings	SA	A	U	D	SD
11.8	Recognize characteristics of a quality constructed bound placket.	SA	A	U	D	SD
11.9	Identify procedures for making a self-fabric belt.	SA	A	U	D	SD

PART II

GENERAL DIRECTIONS: Please complete the following questions:

I. List any additional topic areas you believe should be included.

II. List any additional competencies you believe should be included in the basic clothing construction course.

III. Please read the following definitions of various types of evaluation instruments in the area of clothing construction. Indicate whether your institution uses each type by circling your answer.

YES NO 1. Pretest - Instrument used to ascertain extent of knowledge of the subject prior to specific instruction.

YES NO 2. Placement Test - Instrument used to section students according to knowledge and skill in a subject.

YES NO 3. Exemption Test - Instrument used to determine extent of knowledge and skills for the purpose of allowing students to by-pass specific courses.

YES NO 4. Advanced Standing Examination - Instrument used to grant college credit for a course based on an examination in lieu of enrollment in a course.

YES NO 5. Practical Performance Test - Instrument used to evaluate a student's abilities to perform processes involving manipulation of equipment and materials used in clothing construction.

WE THANK YOU FOR PARTICIPATING IN THIS SURVEY

PLEASE RETURN THE COMPLETED QUESTIONNAIRE IN THE ATTACHED SELF-ADDRESSED STAMPED ENVELOPE

TODAY OR BEFORE OCTOBER 1, 1980

APPENDIX D

FREQUENCY DISTRIBUTION AND MEAN SCORES FOR COMPETENCIES IN BASIC CLOTHING CONSTRUCTION BY 160 RESPONDENTS

FREQUENCY DISTRIBUTION AND MEAN SCORES
FOR COMPETENCIES IN BASIC CLOTHING
CONSTRUCTION BY 160 RESPONDENTS

Competency Number	SA (5)	A (4)	U (3)	D (2)	SD (1)	Mean
1.1	137	20	2	1	0	4.83
1.2	35	49	61	11	4	3.63
1.3	143	14	3	0	0	4.88
1.4	112	42	3	3	0	4.64
1.5	64	62	17	15	2	4.07
1.6	127	27	3	3	0	4.74
1.7	149	10	0	1	0	4.92
1.8	148	12	0	0	0	4.93
2.1	46	73	16	23	2	3.86
2.2	37	66	21	30	6	3.61
2.3	24	55	21	49	11	3.20
2.4	11	35	38	67	9	2.83
2.5	79	74	5	2	0	4.44
2.6	92	67	1	0	0	4.57
2.7	106	47	6	1	0	4.62
2.8	140	18	2	0	0	4.86
2.9	144	16	0	0	0	4.90
2.10	134	25	1	0	0	4.83
2.11	128	31	1	0	0	4.79
3.1	17	56	43	38	6	3.25
3.2	37	84	18	20	1	3.85
3.3	135	23	1	1	0	4.83
3.4	104	54	2	0	0	4.64
3.5	136	23	0	1	0	4.84
3.6	65	66	17	10	2	4.14
3.7	69	79	7	5	0	4.33
4.1	101	54	4	0	0	4.61
4.2	102	53	4	1	0	4.60
4.3	124	31	4	1	0	4.74
4.4	124	33	3	0	0	4.76
4.5	126	34	0	0	0	4.79
4.6	108	47	4	1	0	4.64
5.1	107	51	1	1	0	4.65
5.2	87	61	11	0	1	4.46
5.3	30	62	43	22	3	3.59
5.4	72	72	14	2	0	4.34
5.5	134	25	1	0	0	4.83
5.6	127	31	0	0	2	4.76
5.7	124	35	1	0	0	4.77
6.1	136	23	1	0	0	4.84
6.2	94	50	10	5	1	4.44
6.3	136	24	0	0	0	4.85
6.4	126	33	1	0	0	4.78
6.5	135	25	0	0	0	4.84
6.6	138	22	0	0	0	4.86

Competency Number	SA (5)	A (4)	U (3)	D (2)	SD (1)	Mean
7.1	135	24	1	0	0	4.84
7.2	120	37	3	0	0	4.73
7.3	103	53	4	0	0	4.62
7.4	39	68	35	17	1	3.79
7.5	94	59	6	1	0	4.54
8.1	103	50	5	2	0	4.59
8.2	67	73	14	6	0	4.26
8.3	111	48	0	1	0	4.68
8.4	83	64	9	4	0	4.41
8.5	108	47	4	1	0	4.64
8.6	42	42	30	41	5	3.47
8.7	49	65	16	29	1	3.83
9.1	113	43	2	2	0	4.67
9.2	103	48	5	3	1	4.56
9.3	116	43	1	0	0	4.72
9.4	77	59	11	11	2	4.24
9.5	102	54	4	0	0	4.61
9.6	47	56	36	17	4	3.78
9.7	119	38	2	1	0	4.72
9.8	106	51	0	2	1	4.62
9.9	117	40	2	1	0	4.71
9.10	80	69	6	5	0	4.40
9.11	95	62	1	2	0	4.56
9.12	116	42	0	2	0	4.70
10.1	75	61	13	11	0	4.25
10.2	112	46	2	0	0	4.69
10.3	125	35	0	0	0	4.78
10.4	122	38	0	0	0	4.76
10.5	52	51	27	26	4	3.76
11.1	130	29	0	1	0	4.80
11.2	121	37	1	1	0	4.74
11.3	13	24	28	76	19	2.60
11.4	55	76	17	9	3	4.07
11.5	36	82	25	15	2	3.84
11.6	62	73	11	11	3	4.13
11.7	45	71	21	19	4	3.84
11.8	46	47	25	33	9	3.55
11.9	19	39	42	47	13	3.03

APPENDIX E

COMPETENCIES RATED BY 160 RESPONDENTS AND PRESENTED BY MEAN SCORES IN DESCENDING ORDER ACCORDING TO TOPIC AREA

COMPETENCIES RATED BY 160 RESPONDENTS AND PRESENTED BY MEAN SCORES IN DESCENDING ORDER ACCORDING TO TOPIC AREA

Topic Area and Competency		Mean Score
	(1) PATTERN SELECTION AND PREPARATION	
1.7	Identify markings that appear on patterns or pattern guides	4.92
1.8	Determine appropriate methods of transferring pattern markings to selected fabrics	4.92
1.3	Identify techniques in preparing a pattern for pattern layout	4.87
1.5	Select appropriate pattern sizes and types for various body descriptions and giver measurements	4.85
1.6	Recognize procedures for adhering a pattern to the fabric	4.73
1.4	Identify accepted methods for making alterations on patterns to improve fit	4.65
1.5	Recognize the procedure for relocating darts	4.05
1.2	Utilize metric measurements indicated on patterns	3.65
	(2) FABRIC SELECTION AND PREPARATION	
2.9	Recognize the process of preparing fabric for pattern layout	4.90
2.8	Identify methods for straightening the grain of fabric	4.86
2.10	Identify fabrics which require a one way (nap/pile) layout	4.83
2.11	Identify techniques for cutting fabric	4.79
2.7	Recognize what factors influence the amount of yardate required	4.60
2.6	Identify appropriate notions for selected garments	4.55
2.5	Determine which fabrics are most suitable for specific garments	4.43
2.1	Apply art elements and principles of design in selecting fabrics for different figure types/physiques	3.86
2.2	Define terminology related to fiber, yarn and fabric	3.63
2.3	Differentiate among fabric weaves	3.19
2.4	Identify the various fabric finishes	2.83
	(3) SEWING EQUIPMENT SELECTION, CARE AND USE	
3.3	Recognize the process of threading a sewing machine	4.83
3.5	Recognize factors which influence tension and stitch length	4.83
3.4	Recognize the functions of selected parts of a sewing machine	4.63
3.7	Differentiate among names and purposes of small sewing equipment	4.31
3.6	Identify the procedures for cleaning and/or oiling the sewing machine	4.14
3.2	Determine criteria for selecting small equipment	3.83
3.1	Determine criteria for selecting a sewing machine	3.22
	(4) PRESSING EQUIPMENT AND TECHNIQUES	
4.5	Differentiate between pressing and ironing	4.78
4.4	Select correct iron heat and moisture settings for pressing specific fabrics	4.75
4.3	Determine appropriate pressing equipment and procedures for specific fabrics and construction techniques	4.73
4.6	Identify correct procedure for using presscloths	4.63
4.1	Identify the types of pressing equipment	4.61
4.2	Describe the purpose of selected pressing equipment	4.61
	(5) BASTING AND MACHINE STITCHING	
5.5	Differentiate among types of stitching (reinforcement stitching, understitching, easestitching, edge stitching and staystitching, directional stitching, top stitching)	4.83
5.7	Differentiate between the length of machine stitch to be used for basting, reinforcement stitching and regular stitching	4.76
5.6	Determine the procedure for directional stitching in selected areas of construction (darts, zippers, staystitching)	4.75
5.1	Identify the purpose of basting	4.64
5.2	Differentiate among techniques used for pin basting, hand basting and machine basting	4.44
5.4	Determine what factors influence the method of basting to be used	4.32
5.3	Describe the use of fabric glue and fusible webs	3.56

	Topic Area and Competency	Mean Score
	(6) SEAMS AND SEAM FINISHES	
6.6	Identify placement and purpose of trimming, grading and notching	4.86
6.3	Identify the purpose of a seam finish	4.85
6.1	Determine the characteristics of a plain seam	4.84
6.5	Determine factors which influence the choice of a seam finish	4.84
6.4	Identify various seam finishes (zigzagged, hand overcast, bound, pinked and clean finished)	4.77
6.2	Differentiate among the following types of seams: flat-fell, mock flat-fell, true French, false French and lapped	4.43
	(7) DARTS, PLEATS AND GATHERS	
7.1	Describe the procedure for stitching darts	4.83
7.2	Determine factors which influence technique used in pressing darts	4.70
7.3	Select the most suitable method of pressing darts for specified fabrics	4.61
7.5	Identify the procedure for constructing gathers	4.52
7.4	Identify types of pleats and methods of constructing pleats	3.78
	(8) FACINGS, INTERFACINGS AND LININGS	
8.3	Select appropriate methods of attaching interfacing to specified areas	4.68
8.5	Determine factors which influence the choice of interfacings	4.63
8.1	Differentiate among the definitions of facings, interfacings, linings, interlinings and underlinings	4.57
8.4	Identify the different types of interfacing	4.40
8.2	Distinguish between an extended facing and an applied facing	4.24
8.7	Determine factors which influence whether to line or underline a garment	3.79
8.6	Determine factors which influence whether to interline a garment	3.43
	(9) GARMENT CLOSURES	
9.3	Recognize the correct sequence for inserting a zipper	4.71
9.7	Relate size and shape of button to length of buttonhole	4.71
9.9	Identify the purpose and procedure for sewing on a button using a thread shank	4.71
9.12	Identify the correct procedure for attaching snaps, hooks and eyes	4.69
9.1	Differentiate between lapped and centered zipper construction	4.66
9.5	Identify criteria for a quality buttonhole	4.61
9.8	Differentiate between buttons with and without shanks	4.61
9.11	Select the appropriate fastener for specified situations	4.55
9.2	Identify appropriate placement of zipper according to type of zipper application and garment area	4.54
9.10	Determine factors which influence the choice of buttons for a garment	4.38
9.4	Select correct type of button holes (fabric bound, fabric loop or machine worked) for specified uses	4.21
9.6	Define "bight" in relation to a buttonhole	3.77
	(10) HEM CONSTRUCTION	
10.4	Identify various types and uses of hem finishes	4.76
10.3	Recognize correct process for preparing garment for a hem	4.75
10.2	Determine hem width for specified fabrics and garment styles	4.68
10.1	Identify factors which influence length of garment	4.23
10.5	Identify fusing techniques and products used for hemming purposes	3.74
	(11) MISCELLANEOUS CONSTRUCTION PROCESSES	
11.1	Identify procedures for setting a sleeve in a garment	4.79
11.2	Determine the criteria for quality collars	4.73
11.6	Identify the procedure for preparing and attaching cuffs to a garment	4.12
11.4	Recognize procedures for preparing and attaching a patch pocket	4.06
11.7	Determine procedure for constructing bias bindings	3.83
11.5	Recognize procedures for inserting a pocket in a seam	3.82
11.8	Recognize characteristics of a quality constructed bound placket	3.54
11.9	Identify procedures for making a self-fabric belt	2.99
11.3	Recognize procedures for constructing a welt pocket	2.59

APPENDIX F

ADDITIONAL TOPIC AREAS AND COMPETENCIES SUGGESTED BY CLOTHING FACULTY

Additional Topic Areas and Competencies Suggested by Clothing Faculty Respondents

Key used for assessment of topic areas and competencies suggested by respondents:

A - Included within current list of topic areas and competencies

B - Included in advanced clothing construction courses

C - Not included in clothing construction courses at Oklahoma State University

D - Should be considered for inclusion in basic clothing construction course

Suggested Topic Areas

(A) Sewing techniques for knits

(B) Matching plaids, stripes and designs

(B) Tailoring techniques - using intricate Vogue patterns

(A) Fabric and notion selection

(A) Hand stitching - slip stitch, catch stitch, blind stitch

(D) Importance and achievement of fit

(A) Pattern alteration

(D) Garment alterations (sewn and ready-to-wear)

(D) Consumer values

(C) Consumerism

(C) World of work in clothing construction

(C) Home sewing industry

(B) Trims and monograms

(B) Hand picked zippers

(C) Basic modeling and presentation of garment

(B) Treatment of special fabrics - stretch and sew method

(B) Sewing slacks (men and women)

(D) Evaluation of quality constructed garments

(D) Waistlines - placement, seams, waistbands, casings, and stays

(A) Quick and easy methods of construction

(B) Muslin test garments

(A) Men's clothing

(B) Managerial concepts

(C) Wardrobe coordination

(A) Collars

(B) Industrial machines

(B) Individualizing your dress

Suggested Competencies

(A) Identify right and wrong side of fabric

(A) Differentiate between printed and woven design

(A) Identify types and sizes of needles

(D) Identify unit construction sequence

(A) Know techniques for reinforcing corners

(A) Learn importance and control of fabric grain

(D) Determine the influence of posture upon the fit of garment

(B) Be able to construct bound buttonholes

(A) Learn to read and understand pattern instruction sheets

(A) Identify proper shopping procedures

(B) Identify requirements and value of care labels

(B) Recognize quality construction in ready-to-wear garments

(A) Determine capability of interfacing and fashion fabric

(A) Adjust patterns for different fabrics

(C) Compare ready-to-wear and home sewn clothing

(B) Learn technique in constructing mitered corners

(B) Determine methods for pricing garments

(A) Identify techniques in preshrinking fabrics

(A) Demonstrate knowledge of good design

(A) Determine how texture is related to garment design

(A) Identify methods for constructing plackets

(B) Determine appropriateness of speed and factory methods in construction

(D) Recognize poor fit

(C) Coordinate accessories with garments

(A) Determine correct placement of motifs, trims, buttons, snaps, etc.

(B) Learn techniques for making thread loops

(A) Evaluate figure shape in relation to appropriate style

(A) Recognize method for constructing buttonholes

(D) Demonstrate skills in clothing construction

(A) Explain how a stitch is accomplished

(B) Identify factors for managing a laboratory

(A) Identify techniques for lengthening and shortening garments

(A) Determine fitting techniques

(D) Determine methods of interfacing waistbands

(A) Identify procedures to care for equipment

(A) Understand principles rather than specific skills

(A) Identify construction techniques for neckline treatment

(B) Learn techniques for setting in shaped yokes

(A) Determine appropriate placement procedures for closures

(A) Identify procedures for topstitching

(A) Determine length, width, and shape of darts

APPENDIX G

LIST OF RESOURCES USED TO DEVELOP TEST ITEMS AND ILLUSTRATIONS

Resources

The A B C's of Shortcut Sewing. New York: Simplicity Pattern Co., 1976.

Bancroft, V. S. It's So, Sew Easy. Minneapolis: Burgess Publishing Co., 1970.

Coats and Clark's Sewing Book. New York: Educational Bureau of Coats and Clark, 1967.

Erwin, M. D., and Kinchen, L. A. Clothing for Moderns. New York: Macmillan Co., 1969.

Fabulous Fit. (3rd ed.) New York: Butterick Publishing, 1977.

Hutton, J., and Cunningham, G. Singer Sewing Book, Revised Edition. The Singer Co., 1972.

Lawrence, J., and Yurick, C. Sew Smart in the Classroom. Boulder, CO: Sewing Knits, Inc., 1977.

Let Yourself Sew. New York: Simplicity Pattern Co., 1972.

Lewis, V. S. Comparative Clothing Construction Techniques. Minneapolis: Burgess Publishing Co., 1976.

Perkins, M. Using the Sewing Machine. London: Heineman Educational Books, Ltd., 1977.

Perry, P. (Ed.) (5th ed.). The Butterick Sewing Book. New York: Butterick Publishing, 1976.

Reader's Digest Complete Guide to Sewing. (6th ed.). New York: The Reader's Digest Association, 1979.

Reinertson, R. O. Sewing Techniques. Long Beach, CA: Elot Publishing Co., 1977.

Relis, N., and Strauss, G. Sewing for Fashion Design. Reston, VA: Reston Publishing Co., 1978.

Simplicity Sewing Book (updated). New York: Simplicity Pattern Co., 1979.

The Vogue Sewing Book, Revised Edition. New York: Vogue Patterns, 1975.

Written examinations from the basic clothing construction course at Oklahoma State University.

APPENDIX H

ITEM DATA CARD

COURSE _____ NO. _____

CONTENT _____

OUTCOME _____

ITEM

DIFFICULTY _____ DISCRIMINATING POWER _____

Item Data Card

APPENDIX I

CRITERIA FOR DEVELOPING TEST ITEMS AND TEST ITEM REVIEW FORM

Criteria for Developing Test Items

MULTIPLE CHOICE AND MATCHING:

1. The stem should consist of a question or incomplete statement
2. Four alternatives should be provided
3. All alternatives should be grammatically consistent with stem
4. All unnecessary words should be eliminated
5. The item should contain one correct or best answer
6. Responses should be in column form
7. Clues should be eliminated from the stem
8. Correct responses should be arranged in random order
9. All distracters should be plausible (homogeneous) with regard to knowledge being measured
10. Alternatives should be approximately equal length
11. Negative statements should only be used in the stem when significant learning outcomes require it
12. The test item should relate directly to the competency and topic area

TRUE-FALSE:

1. The stem should be a declarative statement with two alternatives (T-F)
2. The number of true and false items should be approximately equal
3. Statements should be constructed so that they are unequivocally right or wrong
4. Statements should center around one idea and should not be long complex sentences
5. Negative statements should be avoided

References:

Cross, A. Home Economics Evaluation. Columbus, OH: Charles E. Merrill Publishing Co., 1973.

Gronlund, N. E. Measurement and Evaluation in Teaching. New York: Macmillan Publishing Co., 1976.

Name ____________________

Date ____________________

TEST ITEM REVIEW FORM

BASIC CLOTHING CONSTRUCTION EXAMINATION

Please read each test item in the item pool. When any part of a test item needs revision, record the item code number and check (✓) the appropriate error. Any comments regarding improvement of the test item will be appreciated.

TEST ITEM CODE NUMBER	NOT RELATED TO COMPETENCY	TYPING, SPELLING OR GRAMMATICAL ERROR	CLUES OR NEGATIVE STATEMENTS IN STEM	AMBIGUOUS OR LACKS CLARITY	WORDS NEED TO BE ELIMINATED	COMMENTS

APPENDIX J

TEST ITEM ANALYSIS

Test Item Analysis

Item No.	Difficulty	Discrimination	Item No.	Difficulty	Discrimination
1.1.1	44.44	0.12	1.7.9	77.78	0.34
1.1.2	75.00	0.50	1.7.10	100.00	0.00
1.1.3	86.84	0.31	1.7.11	96.77	0.25
1.1.4	63.89	0.53	1.7.12	96.30	0.37
1.1.5	52.63	0.45	1.7.13	67.74	0.45
1.1.6	75.00	0.55	1.8.1	63.89	0.35
1.1.7	86.11	0.50	1.8.2	100.00	0.00
1.1.8	76.32	0.22	1.8.3	92.11	0.49
1.1.9	75.00	0.17	1.8.4	52.63	0.38
1.1.10	94.74	0.17	1.8.5	86.96	0.14
1.1.11	94.44	0.58	1.8.6	95.65	0.15
1.1.12	100.00	0.00	1.8.7	56.52	0.39
1.1.13	54.84	0.06	1.8.8	43.48	0.05
1.1.14	66.67	0.22	1.8.9	82.76	0.11
1.1.15	18.52	0.22	1.8.10	68.97	0.54
1.2.1	77.78	0.51	1.8.11	68.97	0.34
1.2.2	94.74	0.47	1.8.12	39.13	0.39
1.2.3	94.74	0.33	1.8.13	26.09	0.26
1.3.1	91.67	0.09	1.8.14	30.43	0.16
1.3.2	86.96	0.28	1.8.15	56.52	0.30
1.3.3	34.78	0.16	1.8.16	51.72	0.64
1.3.4	59.26	0.58	1.8.17	61.29	0.41
1.4.1	88.89	0.71	1.8.18	81.48	0.01
1.4.2	10.53	0.04	1.8.19	90.32	0.18
1.4.3	66.67	0.02	1.8.20	70.37	0.21
1.4.4	81.58	0.18	1.8.21	70.37	0.07
1.4.5	70.97	0.37	1.8.22	67.74	0.45
1.4.6	51.85	0.17			
1.4.7	51.61	0.19	2.1.1	4.35	0.02
1.4.8	85.19	0.51	2.1.2	95.65	0.15
1.4.9	9.68	0.26	2.1.3	55.17	0.07
1.4.10	18.52	0.09	2.1.4	37.04	0.17
1.5.1	55.56	0.03	2.1.5	58.06	0.28
1.5.2	21.05	0.24	2.2.1	77.78	0.57
1.5.3	69.44	0.38	2.2.2	78.95	0.11
1.5.4	61.29	0.20	2.2.3	47.22	0.69
1.6.1	63.16	0.42	2.2.4	94.74	0.30
1.6.2	66.67	0.35	2.2.5	52.78	0.39
1.6.3	6.45	0.38	2.2.6	89.47	0.10
1.7.1	100.00	0.00	2.2.7	73.91	0.24
1.7.2	76.32	0.40	2.2.8	82.76	0.37
1.7.3	83.33	0.14	2.2.9	30.43	0.38
1.7.4	91.30	0.00	2.2.10	62.96	0.55
1.7.5	86.21	0.39	2.2.11	65.22	0.13
1.7.6	100.00	0.00	2.2.12	83.87	0.52
1.7.7	17.24	0.31	2.2.13	100.00	0.00
1.7.8	100.00	0.00	2.2.14	96.55	0.35

Item No.	Difficulty	Discrimination	Item No.	Difficulty	Discrimination
2.2.15	93.10	0.35	3.1.1	86.96	0.33
2.2.16	31.03	0.45	3.1.2	55.17	0.33
2.2.17	83.87	0.37	3.1.3	86.96	0.09
2.2.18	25.93	0.26	3.1.4	66.67	0.44
2.2.19	64.52	0.29	3.2.1	94.44	0.14
2.2.20	70.37	0.15	3.2.2	67.74	0.31
2.2.21	80.65	0.28	3.2.3	44.83	-0.15
2.3.1	83.33	0.52	3.2.4	48.15	0.29
2.3.2	89.47	0.31	3.2.5	61.29	0.12
2.4.1	73.68	0.10	3.2.6	55.56	0.31
2.4.2	17.39	0.13	3.3.1	94.74	-0.22
2.4.3	100.00	0.00	3.3.2	97.22	0.19
2.4.4	41.94	0.38	3.3.3	86.84	0.10
2.4.5	67.74	0.03	3.3.4	61.11	0.25
2.4.6	85.19	0.23	3.3.5	94.74	0.18
2.5.1	83.33	0.53	3.3.6	86.21	0.19
2.5.2	88.89	0.04	3.3.7	68.97	0.18
2.6.1	81.58	0.36	3.3.8	41.94	0.32
2.6.2	55.56	0.54	3.3.9	74.07	0.10
2.6.3	62.07	0.38	3.3.10	90.32	0.61
2.6.4	60.87	0.54	3.3.11	86.21	-0.02
2.6.5	34.48	0.39	3.3.12	85.19	0.11
2.6.6	52.17	0.36	3.3.13	96.77	0.60
2.6.7	48.28	0.21	3.3.14	74.07	-0.06
2.6.8	24.14	-0.10	3.3.15	96.77	0.60
2.7.1	73.68	0.19	3.3.16	96.30	0.23
2.7.2	86.96	0.44	3.3.17	83.87	0.53
2.7.3	91.30	0.42	3.3.18	45.16	0.30
2.7.4	72.41	0.09	3.4.1	82.61	0.09
2.7.5	82.61	0.50	3.4.2	73.91	0.35
2.7.6	72.41	0.41	3.4.3	43.38	0.08
2.7.7	73.91	0.51	3.4.4	69.57	0.14
2.7.8	82.76	0.26	3.4.5	44.44	0.32
2.7.9	82.61	0.50	3.5.1	88.89	-0.04
2.7.10	45.16	0.25	3.5.2	45.16	0.10
2.7.11	85.19	-0.03	3.5.3	77.78	-0.31
2.7.12	100.00	0.00	3.5.4	87.10	0.34
2.7.13	80.65	0.43	3.5.5	92.59	0.51
2.8.1	97.22	0.28	3.6.1	69.44	0.41
2.8.2	76.32	0.34	3.6.2	68.42	0.27
2.8.3	82.61	0.50	3.6.3	97.22	0.26
2.8.4	6.90	0.05	3.6.4	39.47	0.32
2.8.5	47.83	0.00	3.6.5	96.55	-0.01
2.8.6	33.33	0.20	3.6.6	96.55	0.26
2.9.1	69.44	0.13	3.6.7	25.81	0.18
2.9.2	72.22	0.32	3.6.8	81.48	0.37
2.9.3	92.11	0.28	3.6.9	72.41	-0.15
2.9.4	66.67	0.08	3.6.10	51.61	0.28
2.9.5	82.61	0.31	3.6.11	92.59	0.26

Item No.	Difficulty	Discrimination	Item No.	Difficulty	Discrimination
3.6.12	59.26	0.05	5.1.1	100.00	0.00
3.6.13	96.77	0.60	5.2.1	61.11	0.43
3.6.14	44.44	0.07	5.2.2	44.74	0.06
3.6.15	77.42	0.15	5.2.3	52.78	0.46
3.6.16	77.78	-0.26	5.2.4	88.89	-0.05
3.6.17	74.19	-0.14	5.2.5	47.83	0.39
3.6.18	85.19	-0.13	5.2.6	69.57	0.12
3.6.19	80.65	0.27	5.2.7	48.28	0.12
3.6.20	66.67	0.13	5.2.8	64.52	0.07
3.6.21	83.87	0.07	5.3.1	71.05	0.26
3.6.22	70.37	0.32	5.3.2	29.03	0.32
3.6.23	87.10	0.52	5.3.3	14.81	0.41
3.6.24	66.67	-0.21	5.3.4	25.81	-0.24
3.6.25	87.10	0.06	5.3.5	37.04	0.48
3.6.26	96.30	0.37	5.3.6	74.19	0.33
3.6.27	77.42	0.33	5.4.1	47.22	0.27
3.6.28	88.89	0.34	5.4.2	81.58	0.18
			5.4.3	61.11	0.30
4.1.1	100.00	0.00	5.4.4	44.74	0.57
4.1.2	83.87	0.30	5.4.5	39.13	0.23
4.1.3	85.19	0.33	5.5.1	38.89	0.50
4.1.4	9.68	0.13	5.5.2	77.78	0.58
4.1.5	85.19	0.25	5.5.3	86.84	0.38
4.1.6	77.42	0.15	5.5.4	83.33	0.70
4.2.1	74.07	0.15	5.5.5	77.78	0.51
4.2.2	74.19	0.46	5.5.6	58.06	0.32
4.2.3	88.89	0.41	5.5.7	21.74	0.53
4.2.4	61.27	0.14	5.5.8	55.56	0.51
4.2.5	77.78	0.59	5.5.9	100.00	0.00
4.2.6	80.65	0.04	5.5.10	59.26	0.44
4.3.1	63.16	0.40	5.5.11	77.42	0.27
4.3.2	80.56	0.69	5.5.12	18.52	0.32
4.3.3	78.95	0.30	5.5.13	90.32	0.36
4.3.4	33.33	0.20	5.5.14	96.30	-0.28
4.3.5	63.16	-0.03	5.5.15	70.97	0.32
4.3.6	52.78	0.40	5.5.16	51.85	0.07
4.3.7	19.44	-0.01	5.5.17	48.39	0.51
4.3.8	79.31	0.20	5.5.18	100.00	0.00
4.3.9	87.10	0.65	5.5.19	77.42	0.09
4.3.10	62.96	-0.08	5.5.20	11.11	0.32
4.3.11	59.26	0.64	5.6.1	85.19	0.45
4.3.12	64.52	0.17	5.6.2	58.06	0.10
4.3.13	18.52	0.33	5.6.3	22.22	0.26
4.3.14	45.16	0.15	5.6.4	45.16	0.08
4.4.1	97.37	0.03	5.6.5	33.33	0.22
4.5.1	84.21	0.33	5.6.6	19.35	0.31
4.5.2	61.29	0.44	5.6.7	22.22	0.04
4.6.1	0.0	0.00	5.6.8	22.58	0.22
4.6.2	77.78	-0.00	5.6.9	37.04	0.11
			5.6.10	19.35	-0.04

Item No.	Difficulty	Discrimination	Item No.	Difficulty	Discrimination
7.5.6	85.19	0.07	9.8.3	51.61	-0.06
			9.9.1	74.07	0.27
8.1.1	63.16	0.19	9.9.2	55.17	0.15
8.1.2	61.11	0.39	9.9.3	48.39	0.55
8.1.3	81.58	0.28	9.10.1	96.30	0.18
8.1.4	72.22	0.33	9.11.1	45.16	0.16
8.1.5	89.47	0.00	9.11.2	79.31	0.03
8.1.6	58.33	0.05	9.11.3	74.07	-0.36
8.1.7	78.95	0.28	9.12.1	34.21	0.24
8.1.8	88.89	0.62	9.12.2	69.44	0.17
8.1.9	67.74	0.51	9.12.3	12.90	0.23
8.2.1	78.95	0.44			
8.2.2	38.89	0.56	10.1.1	88.89	0.23
8.2.3	71.05	0.40	10.1.2	82.76	0.15
8.2.4	72.41	0.08	10.1.3	54.89	0.11
8.2.5	45.16	0.27	10.2.1	81.58	0.20
8.2.6	48.15	0.23	10.2.2	31.58	-0.25
8.3.1	86.11	0.30	10.2.3	13.16	0.22
8.3.2	34.78	0.11	10.2.4	58.33	-0.32
8.3.3	92.59	0.20	10.2.5	77.78	0.46
8.4.1	76.32	0.67	10.3.1	73.68	0.38
8.5.1	47.22	0.11	10.3.2	94.74	0.47
8.6.1	38.89	0.19	10.3.3	31.58	0.18
8.6.2	82.76	0.17	10.3.4	88.89	0.22
			10.3.5	40.74	-0.19
9.1.1	52.63	0.10	10.3.6	96.77	0.60
9.2.1	58.33	0.01	10.4.1	55.26	0.36
9.2.2	28.95	0.08	10.4.2	52.78	0.29
9.2.3	47.22	0.33	10.4.3	28.95	0.27
9.3.1	84.21	0.22	10.4.4	71.05	0.36
9.3.2	65.22	0.11	10.4.5	19.44	0.35
9.3.3	96.55	-0.10	10.4.6	21.74	0.39
9.4.1	41.94	0.38	10.4.7	74.19	0.34
9.4.2	51.85	0.56	10.4.8	70.37	0.33
9.4.3	59.26	0.61	10.4.9	25.81	0.01
9.4.4	90.32	0.24	10.4.10	85.19	0.17
9.4.5	61.29	0.45	10.5.1	92.11	0.25
9.4.6	55.17	0.10	10.5.2	52.63	0.04
9.4.7	25.81	0.32	10.5.3	77.78	0.54
9.4.8	18.52	0.04			
9.4.9	81.48	0.03	11.1.1	31.58	0.29
9.5.1	31.03	0.42	11.1.2	69.44	0.24
9.5.2	69.57	-0.06	11.1.3	57.89	0.42
9.5.3	59.26	0.03	11.1.4	60.87	0.19
9.6.1	33.33	0.35	11.1.5	97.22	0.26
9.6.2	39.47	0.26	11.1.6	79.31	0.22
9.7.1	44.44	0.51	11.1.7	96.30	0.37
9.8.1	42.11	-0.18	11.1.8	93.55	0.38
9.8.2	79.31	0.32	11.1.9	96.30	0.23

Item No.	Difficulty	Discrimination	Item No.	Difficulty	Discrimination
5.6.11	74.07	-0.12	6.6.3	73.68	0.11
5.6.12	35.48	0.27	6.6.4	63.89	0.10
5.6.13	62.96	0.14	6.6.5	31.58	0.14
5.6.14	29.03	0.46	6.6.6	25.00	0.48
5.6.15	62.96	-0.01	6.6.7	21.05	0.00
5.6.16	25.81	-0.10	6.6.8	55.56	0.15
5.6.17	29.63	0.16	6.6.9	55.56	0.46
5.7.1	97.37	0.09	6.6.10	65.79	0.31
5.7.2	31.03	0.47	6.6.11	96.55	-0.10
5.7.3	91.30	0.42	6.6.12	93.10	0.35
5.7.4	56.52	0.25	6.6.13	32.26	0.36
5.7.5	55.17	0.01	6.6.14	59.26	0.25
			6.6.15	55.56	0.27
6.1.1	97.22	0.26	6.6.16	64.52	0.04
6.1.2	100.00	0.00	6.6.17	40.74	0.20
6.2.1	63.89	0.41			
6.2.2	60.53	0.43	7.1.1	81.58	0.37
6.2.3	83.33	0.66	7.1.2	77.78	0.52
6.2.4	44.74	0.60	7.1.3	86.11	0.08
6.2.5	61.11	0.12	7.1.4	81.58	0.23
6.2.6	76.32	0.45	7.1.5	65.52	0.38
6.2.7	69.44	0.20	7.1.6	34.48	0.31
6.2.8	63.16	0.27	7.1.7	93.55	0.05
6.2.9	36.11	0.46	7.1.8	48.39	0.26
6.2.10	56.52	0.19	7.2.1	92.11	0.03
6.2.11	82.76	0.11	7.2.2	69.44	0.47
6.2.12	58.06	0.29	7.2.3	52.63	0.18
6.2.13	74.07	0.37	7.2.4	69.44	0.44
6.3.1	97.37	0.18	7.2.5	71.05	0.56
6.3.2	87.10	0.39	7.2.6	86.11	-0.10
6.3.3	48.39	0.31	7.3.1	92.11	0.17
6.4.1	75.00	0.05	7.3.2	47.22	0.51
6.4.2	68.42	0.32	7.3.3	68.42	0.31
6.4.3	55.56	-0.02	7.3.4	58.33	0.48
6.4.4	81.48	0.25	7.3.5	76.32	0.01
6.5.1	65.79	0.23	7.3.6	50.00	0.51
6.5.2	80.56	0.71	7.3.7	68.42	0.12
6.5.3	76.32	0.10	7.3.8	30.56	0.49
6.5.4	33.33	0.45	7.3.9	47.37	0.11
6.5.5	63.16	0.04	7.3.10	44.44	0.10
6.5.6	38.89	-0.13	7.4.1	94.44	0.15
6.5.7	57.89	0.01	7.4.2	52.63	0.16
6.5.8	33.33	0.22	7.4.3	58.33	-0.02
6.5.9	13.16	-0.03	7.4.4	68.42	0.32
6.5.10	22.22	0.41	7.4.5	100.00	0.00
6.5.11	71.05	0.42	7.5.1	7.89	0.30
6.5.12	62.96	0.13	7.5.2	73.68	0.07
6.6.1	94.74	0.18	7.5.3	63.89	0.53
6.6.2	47.22	0.39	7.5.4	30.43	0.48

Item No.	Difficulty	Discrimination	Item No.	Difficulty	Discrimination
11.1.10	80.65	0.42	11.3.1	83.87	0.34
11.1.11	64.52	0.11	11.3.2	62.96	0.56
11.1.12	96.77	-0.05	11.3.3	64.52	0.22
11.2.1	44.44	0.05	11.4.1	88.89	0.24
11.2.2	40.74	0.26	11.5.1	77.88	-0.17
11.2.3	54.84	0.41	11.6.1	44.44	-0.06
11.2.4	77.78	0.32	11.6.2	25.93	0.34
11.2.5	16.13	0.30	11.7.1	86.21	0.44
11.2.6	29.63	0.23	11.7.2	3.45	0.15
11.2.7	25.81	0.16			
11.2.8	59.26	0.67			
11.2.9	19.35	-0.23			

APPENDIX K

SCORES FOR AVERAGE OF NOTEBOOK AND GARMENT SCORES AND EXAMINATION AVERAGE

SCORES FOR AVERAGE OF NOTEBOOK AND GARMENT SCORES AND EXAMINATION AVERAGE

Student Number	Notebook and Garment Average	Examination Average	Student Number	Notebook and Garment Average	Examination Average
1	98.25	77.00	66	87.75	61.00
2	99.00	69.00	67	96.00	50.00
3	97.25	63.00	68	95.50	68.00
4	98.50	83.00	69	98.25	92.00
5	99.00	71.00	70	97.25	70.00
6	96.00	63.00	71	97.50	69.00
7	96.25	72.00	72	94.50	78.00
8	95.25	64.00	73	92.25	71.00
9	98.75	73.00	74	95.50	78.00
10	97.00	69.00	75	87.50	62.00
11	97.75	71.00	76	99.00	65.00
12	97.25	65.00	77	95.00	55.50
13	99.25	85.00	78	99.00	73.00
14	98.25	81.00	79	88.00	67.00
15	97.75	73.00	80	94.50	55.00
16	95.25	64.00	81	93.50	61.50
17	75.00	70.00	82	78.50	65.00
18	96.50	60.00	83	87.00	60.00
19	96.50	67.00	84	88.00	54.00
20	95.00	69.00	85	98.00	62.00
21	97.50	86.00	86	93.00	64.50
22	88.00	60.00	87	93.00	64.00
23	94.75	75.00	88	95.50	63.50
24	96.25	71.00	89	98.50	72.00
25	96.25	74.00	90	93.50	67.50
26	98.75	81.00	91	98.00	69.00
27	91.00	67.00	92	91.00	62.00
28	98.00	75.00	93	92.50	63.50
29	99.00	80.00	94	71.50	52.00
30	90.75	45.00	95	97.50	61.50
31	97.00	75.00	96	98.50	73.00
32	98.75	79.00	97	91.00	69.00
33	94.50	59.00	98	98.00	56.50
34	96.75	66.00	99	80.00	63.50
35	97.75	78.00	100	99.50	70.00
36	98.25	80.00	101	95.00	55.00
37	96.75	74.00	102	97.50	65.00
38	96.25	64.00	103	89.00	67.00
39	94.75	72.00	104	96.50	61.00
40	96.75	55.00	105	85.00	58.00
41	85.75	51.00	106	99.50	73.00
42	86.50	71.00	107	96.50	64.50
43	93.00	69.00	108	99.50	77.00
44	98.25	58.00	109	98.00	78.00
45	93.75	60.00	110	94.00	40.50
46	87.25	43.00	111	90.00	70.00
47	95.50	67.00	112	96.00	57.00
48	96.75	73.00	113	93.00	55.50
49	97.25	70.00	114	79.00	58.00
50	96.75	67.00	115	88.00	65.00
51	98.25	75.00	116	87.50	54.50
52	91.75	59.00	117	94.50	61.00
53	98.75	45.00	118	87.00	58.50
54	91.25	64.00	119	98.50	71.50
55	92.50	69.00	120	95.00	67.00
56	94.75	53.00	121	90.50	44.00
57	87.00	51.00	122	93.00	48.00
58	97.75	66.00	123	95.00	71.00
59	97.50	77.00	124	96.50	78.00
60	98.25	67.00	125	95.00	63.50
61	96.25	67.00	126	93.00	60.00
62	88.50	50.00	127	94.00	60.00
63	96.75	66.00	128	90.00	60.00
64	96.00	61.00	129	77.50	77.00
65	92.75	34.00	130	95.50	69.50

APPENDIX L

PATTERN OF ITEM SELECTION FOR COMPUTER-GENERATED EXAMINATIONS

ITEMS SELECTED FOR SAMPLE EXAMINATIONS

Item	Examination Number 1	2	3	4	5	6	7	8
1001	X			X	X			
1002		X	X	X				X
1003		X						
1004	X					X	X	
1005			X		X		X	X
1006			X		X		X	
1007				X		X		X
1008			X	X	X	X		X
1009		X	X					
1010	X			X			X	
1011		X	X		X			
1012						X		
1013					X		X	
1014			X	X				
1015		X						
1016	X						X	
1017		X				X		
1018					X	X		X
1019	X					X		X
1020	X	X		X				X
1021	X						X	
2001	X	X	X	X	X			
2002			X	X	X	X		X
2003				X	X		X	X
2004		X		X	X		X	
2005			X	X		X	X	
2006	X					X		
2007	X			X	X		X	
2008			X					X
2009	X		X		X			
2010				X	X			
2011			X			X		X
2012	X	X						
2013	X	X					X	X
2014		X	X				X	
2015						X	X	X
2016	X	X				X		X
2017		X				X		
3001	X	X	X	X	X	X	X	X
3002	X	X	X	X	X	X	X	X
3003	X	X	X	X	X	X	X	X
3004	X	X	X	X	X	X		X
3005	X	X	X	X	X	X	X	X
3006	X	X	X	X	X	X	X	X
3007	X	X	X	X	X	X	X	
3008	X	X	X	X	X	X	X	X
3009	X	X	X	X	X	X	X	X
3010	X	X	X	X	X	X	X	
3011	X	X	X	X	X	X	X	X
3012		X	X	X	X	X	X	X
3013	X	X	X	X	X	X	X	X
3014	X	X	X		X	X	X	X
3015	X	X	X		X	X	X	X
3016	X			X	X		X	X
3017			X		X	X		
3018		X	X	X		X		X
3019	X	X	X	X		X		X
3020	X	X	X	X		X	X	X
3021	X			X	X		X	X
3022	X				X		X	
3023		X		X			X	
3024								X
3025								
3026					X		X	
3027								
3028		X						
3029								
3030			X	X		X		
3031								
3032			X	X		X		
3033								
3034		X						
3035								
3036					X		X	
3037								
3038								X
3039								
3040	X							
3041								
3042	X							
3043								
3044								X
3045		X						
3046					X		X	
3047								
3048		X	X					
3049				X				
3050			X			X		
3051					X		X	
3052			X	X		X		
3053	X							X
3054		X						
3055								
3056					X		X	
3057			X					X
3058	X			X		X	X	X
3059	X			X		X		
3060	X	X			X			X
4001							X	X
4002					X			
4003	X		X		X	X		X
4004		X		X		X	X	
4005	X		X	X	X	X		
4006				X			X	X
4007	X		X		X		X	X
4008	X	X	X	X		X		
4009	X	X						
4010	X		X		X	X	X	
4011					X			X
4012		X	X					
4013		X		X				
4014		X		X			X	X
4015	X		X			X	X	
4016	X							X
4017		X		X	X	X	X	
4018		X			X	X	X	
4019		X	X	X		X		
4020	X			X				X
4021			X		X			X
5001	X	X			X		X	X

Item	Examination Number 1	2	3	4	5	6	7	8
5002				X	X			X
5003	X		X	X		X		X
5004	X		X	X	X			X
5005	X	X	X			X		X
5006		X	X				X	X
5007	X					X	X	X
5008		X		X		X	X	
5009	X					X		
5010								X
5011	X	X						X
5012	X	X	X		X	X	X	
5013								
5014	X	X	X				X	
5015						X	X	
5016		X			X	X		X
5017		X					X	
5018	X	X		X	X	X	X	X
5019				X				
5020				X	X	X		
5021		X				X		
5022		X		X				
5023				X	X			
5024	X	X	X		X			X
5025				X		X	X	
5026							X	
5027	X	X	X		X			
5028		X	X	X	X	X		
5029			X		X			
5030	X		X	X	X	X	X	
5031	X	X			X			
5032			X		X	X	X	X
5033		X		X			X	
5034		X	X				X	
5035			X	X	X	X		X
5036			X	X			X	X
5037		X			X	X		
5038				X				
5039	X					X	X	X
5040	X	X	X	X	X	X	X	
5041				X	X			X
5042	X		X	X			X	X

Item	Examination Number 1	2	3	4	5	6	7	8
5043	X	X	X	X			X	X
5044	X		X	X	X	X		X
6001	X	X		X		X	X	X
6002		X			X			
6003	X						X	X
6004				X			X	
6005			X	X	X	X		X
6006	X	X	X	X		X	X	
6007				X		X	X	
6008			X		X	X		X
6009			X		X		X	
6010			X	X	X		X	X
6011		X	X	X				
6012		X	X		X	X		X
6013	X	X						
6014						X		X
6015	X	X	X	X			X	X
6016			X			X		
6017	X	X			X			X
6018		X			X			
6019				X		X		X
6020						X		X
6021					X			
6022			X	X	X	X	X	
6023	X						X	X
6024		X			X			
6025	X							
6026	X		X					
6027	X	X			X	X		X
6028	X	X	X	X	X	X		X
6029	X	X		X	X	X	X	X
6030	X	X				X		
6031	X			X			X	X
6032	X	X		X	X	X		
6033		X	X			X	X	X
6034		X	X	X				
6035			X				X	X
6036				X				
6037			X		X		X	
6038	X		X	X	X		X	
6039				X	X	X	X	

Item	Examination Number 1	2	3	4	5	6	7	8
6040	X	X					X	
6041	X		X					
7001	X							
7002				X				
7003	X		X				X	
7004		X			X	X		X
7005								
7006						X		
7007		X	X	X	X		X	X
8001								
8002		X	X	X		X	X	
8003	X							
8004		X	X	X	X		X	X
8005					X			X
8006	X					X		
9001								X
9002		X	X	X			X	
9003		X	X		X	X		
9004	X			X	X		X	
9005	X	X						
9006	X		X		X			
9007					X	X	X	
9008				X				
9009	X	X						
9010			X			X		X
9011	X					X		
9012	X	X	X			X	X	
9013		X		X	X		X	
9014			X					X
9015						X		X
9016		X					X	X
9017			X	X			X	X
9018				X	X			X
9019	X			X	X	X		
10001								
10002		X	X		X			
10003	X	X	X	X	X	X	X	X
10004	X			X		X	X	X
11001	X			X				
11002		X	X			X	X	
11003							X	X

VITA

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